

Table of Contents

1.0	INTRODUCTION	
1.1	General	5
1.2	Description of Refuge	5
1.3	Historical/Ecological Role of Fire	20
1.4	Refuge Fire History	21
2.0	POLICY COMPLIANCE - GOALS AND OBJECTIVES	
2.1	Compliance with Service Policy	22
2.2	NEPA Compliance	23
2.3	Authorities Citation	23
2.4	Other Regulatory Guidelines	24
2.5	Enabling Legislation and Purpose of the Refuge (Mission Statement)	25
2.6	Overview of Planning Documents	25
2.7	Land Management Goals and Objectives	25
3.0	REFUGE FIRE MANAGEMENT OBJECTIVES	
3.1	Habitat Management Goals and Objectives	26
3.2	Fire Management Goals and Objectives	27
4.0	FIRE MANAGEMENT STRATEGIES	
4.1	Implementation Strategies	27
4.2	Limits to Implementation Strategies	28
4.3	Impacts on neighboring lands	28
5.0	FIRE MANAGEMENT RESPONSIBILITIES	
5.1	Refuge Staff Responsibilities	29
5.2	Cooperator Involvement	32
6.0	FIRE SEASON	
6.1	Refuge Fire Frequency	33
6.2	Refuge Fire Season	33
7.0	EQUIPMENT AND STAFFING NEEDS	
7.1	Normal Unit Strength	33
7.2	Personnel and level of Qualifications	34

8.0	PREPAREDNESS	
8.1	Current staff available to meet position needs	35
8.2	Preparedness activities	35
9.0	WILDFIRE PROGRAM	
9.1	Special Safety Concerns and Firefighter Safety	38
9.2	Prevention Program	38
9.3	Detection	39
9.4	Initial Reporting and Dispatching	39
9.5	Fire Suppression	40
9.6	Escaped Fires and Extended Attack	42
9.7	Mop Up Standards and Rehabilitation	42
10.0	PRESCRIBED FIRE PROGRAM	
10.1	Program Overview	43
10.2	Complexity	46
10.3	Planning	46
10.4	Preparation and Implementation	49
10.5	Monitoring and Evaluation	49
11.0	FIRE MANAGEMENT UNITS	
11.1	General	49
11.2	Fuels and Expected Fire Behavior	50
11.3	Fire Effects	53
11.4	Unit Fire Objectives	54
11.5	Unit Strategies	54
11.6	Unit Tactics	54
11.7	Limits to Strategy and Tactics	55
11.8	Special Concerns	55
12.0	ADDITIONAL OPERATIONAL ELEMENTS	
12.1	Public Safety	55
12.2	Public Information and Education	56
12.3	Prescribed or Wildland Fire Follow up Procedures	57
12.4	Fire Critique and Review	57
13.0	AIR QUALITY AND SMOKE MANAGEMENT GUIDELINES	58

14.0	CULTURAL RESOURCES	58
15.0	FIRE RESEARCH NEEDS	60
16.0	CONSULTATION AND COORDINATION	60
17.0	LITERATURE CITED	60

List of Figures:

Figure 1: Regional Map - Tewaukon NWR and WMD	6
Figure 2: Tewaukon National Wildlife Complex	7
Figure 3: Tewaukon Unit	8
Figure 4: Sprague Lake Unit	9
Figure 5: WPAs - Sargent County	10
Figure 6: WPAs - Ransom County	11
Figure 7: WPAs - Richland County	12

List of Tables:

Table 1: Tewaukon Complex Units	5
Table 2: Threatened, Endangered, Candidate Species	18
Table 3: Summary of Wildland Fire History 1967-1998	22
Table 4: Target Positions and Qualifications	34
Table 5: Appropriate Management Response	41
Table 6: Primary Habitat Types	50

List of Appendices

Appendix A: Fire History
Appendix B: Staff Fire Qualifications
Appendix C: Cooperative Agreements
Appendix D: Normal Unit Strength
Appendix E: Fitness Testing
Appendix F: Step-up Plan
Appendix G: Dispatch Plan
Appendix H: WFSA and Delegation of Authority
Appendix I: Complexity Analysis
Appendix J: Monitoring Plan
Appendix K: Comprehensive Conservation Plan

FIRE MANAGEMENT PLAN

1.0 INTRODUCTION

1.1 General

One of the primary objectives of the U.S. Fish and Wildlife Service (Service) in managing natural areas is the maintenance of ecosystems and their dynamic processes to ensure as nearly as possible a functional natural environment. Wildland fire, as one of these processes, can constitute one of the greatest influences on an ecosystem.

U.S. Fish and Wildlife Service policy requires that an approved Fire Management Plan must be in place for all of Service lands with burnable vegetation. This plan fulfills this requirement and also conforms to the land management goals and objectives identified in the Tewaukon Comprehensive Conservation Plan (2000).

1.2 Description of Refuge

1.2.1 Location

The Tewaukon Complex is located in southeastern North Dakota and consists of two administrative units, Tewaukon National Wildlife Refuge (NWR) and Tewaukon Wetland Management District (WMD) (Figures 1-7). The office for both of these units is located near Cayuga, North Dakota. The town of Cayuga lies 4 miles north of the refuge, the Minnesota state line is 36 miles east, and the South Dakota state line is 4 miles south.

Table 1: Tewaukon Complex Units

Unit	Acres
Tewaukon National Wildlife Refuge	8,363
Tewaukon Wetland Management District	14,000

1.2.2 Topography and Slope

The Complex is located in the rolling prairie pothole region and is spread out over four physiographic regions. Elevation varies from 950 - 1300 feet. The eastern portion of the Complex is located in the Red River Valley. This area, characterized by flat land, was once the bed of glacial Lake Agassiz. There are only a few Service tracts in this area.

The Collapse Coteau Moraine covers the majority of the land within Sargent and southwestern Richland County where Complex lands are located. This glaciated area is characterized by gently rolling topography with numerous wetlands ranging from one-tenth acre to several hundred acres in size. The meandering Wild Rice River Valley is located in this area. The river

Figure 1: Regional Map - Tewaukon NWR and WMD

Figure 2: Tewaukon National Wildlife Refuge Complex

Figure 3: Tewaukon Unit

Figure 4: Sprague Lake Unit

Figure 5: Waterfowl Production Areas - Sargent County

Figure 6: Waterfowl Production Areas - Ransom County

Figure 7: Waterfowl Production Areas - Richland County

valley supports a narrow band of tall grass riparian vegetation. Gently rolling topography with numerous wetlands ranging from one-tenth acre to several hundred acres in size is common.

The northwestern area of the Complex lies within the Drift Prairie region. The Drift Prairie has rolling terrain with an interspersed wetlands, native prairie, hayfields, and a variety of grain crops.

The southwestern portion of the Complex, a remnant of glacial Dakota Lake, is a relatively flat area that has no Service properties.

1.2.3 Soils

The soils within the three counties comprising the Complex have been completely inventoried by the U.S. Soil Conservation Service, and detailed mapping is available. The dominant soils of Sargent County are forman-Aastad loams. Ransom County soils are dominated by the Barnes Soil Association. Fargo silty clay and Embden-Tiffany are the two most common soil types in Richland County. The majority of the upland sites in the Complex are high in organic matter and nutrients and have adequate topsoil to establish and support grassland stands. Upland areas with grass cover generally form a resilient sod which is not easily penetrated. Rolling topography generally limits water erosion to isolated drainages. Exposed soils can be subject to severe wind erosion if snow cover is limited, and bare soil areas between bunch grasses or sites of animal burrows can be rapidly colonized by weed species after disturbance.

1.2.4 Water

The wetlands in Tewaukon Complex are extremely productive and very attractive to migratory waterfowl and resident wildlife. They serve as breeding and nesting areas for migratory birds and as wintering habitat for many species of resident wildlife. Approximately 22,522 acres of Complex land have associated wetlands.

The meandering Wild Rice River Valley is located in this area of the Complex and flows from west to east and then north out of Lake Tewaukon and eventually into the Red River. The river valley supports a narrow band of tall grass - riparian vegetation.

1.2.5 Climate

The area's semi-arid climate is characterized by long cold winters, short dry summers, with a growing season of approximately 90 days. Temperatures can fluctuate quickly and range from -35° to 110°F. The cool, dry, sub humid climate has an annual precipitation of 21 inches and the wind exceeds 25 MPH during 185 days per year. These factors result in very high evapotranspiration losses from the marsh and water areas.

Factors affecting fire conditions include summer temperatures ranging from the 80-100°F in July through August and intense thunderstorms which occur frequently in summer. The prevailing wind is from the northwest with an average daily windspeeds of 10 mph. Winds

usually build in the morning and develop into sustained strong breezes rather than occasional gales. Wind speeds are usually highest during the afternoon and lowest at night. Frontal winds of 25-30 mph often last for 6 hours and have been recorded for as long as 15 hours. Wind speeds of more than 30 mph have been recorded to last longer than 6 hours, with occasional gusts of 35-50 mph.

The Complex operates an automated weather station. The weather station has the ability to calculate fuel moisture and can be linked to the Weather Information Management System (WIMS) in order to produce daily fire weather predictions. The Complex is located in the National Fire Danger Rating System (NFDRS) climate class 1 area (semiarid).

1.2.6 Vegetation

Grasslands

Comprehensive surveys of all units within the Complex have not been completed, but most of the grassland habitat on the complex can be divided into three classes: native sod, planted natives, or dense nesting cover (DNC).

The Complex is in the eastern tall grass prairie region of North Dakota. Uplands are divided into high grassland and short grassland, and lowlands into meadow and marsh (Dix and Smeins, 1967). Most of the uplands on the Complex have sites within the predominant plant community that fit more than one of these general habitat descriptions. For example, a field that is predominantly planted native grass (tall grassland) may contain short grassland, meadow, and marsh zones around a large wetland in the middle of it.

Tall grassland sites are usually located on well drained soils. Brush species including wood rose and western snowberry can be a component of these sites. Planted natives and native sod are usually dominated by various combinations of grasses and forbs including: big and little bluestem, switch grass, Indian grass, green needle grass, fringed sage, narrow leaved blazing star, prairie wild rose, hairy golden aster, pasque flower, lead plant, silver leaf scurf pea and Missouri goldenrod. Smooth brome and Kentucky bluegrass, two exotics are often large components of these stands as well.

DNC sites are planted cover consisting of a mixture of wheat grasses and alfalfa. Many of these sites are now dominated by brome and Kentucky bluegrass, but an alfalfa component remains. Some forbs or some of the tall grass species may be represented in these stands, but they are generally scattered and only a small percentage of the overall cover.

Low grassland sites are on moderately drained soils. Dominant species include big bluestem, switch grass, Baltic rush, cordgrass, reed canary grass, Kentucky bluegrass, black eyed Susan, and Maximilian's sunflower. Less common species of these sites are smooth aster, prairie dropseed, and wild licorice.

Meadow sites are poorly drained and the water table is usually within the rooting depths of most

plants. Water is usually present in the marsh sites, and in these depressions or potholes, soils are usually inundated for extended periods. Dominant species of meadows on the area are reed canary grass, narrow leafed sedge, fox tail barley, prairie cordgrass, smooth aster, wild mint, and smart weeds.

Marsh sites are dominated by common cattail, hybrid cattail, hardstem bulrush, soft stem bulrush, spike rush, common smart weed, slough grass, and water plantain. Cattails are a significant management problem for maintaining productive wetlands in the Complex. Wetlands become dominated by dense stands of cattail, resulting in little open water for waterfowl.

Noxious Weeds

Leafy spurge, Canada thistle, and wormwood sage are the three most common noxious weeds found throughout all vegetative types. State law dictates control efforts for noxious weeds and the Complex voluntarily participates in control programs, including the use of prescribed fire. Herbicides applied in the fall followed by spring burning provided the best control of leafy spurge density and seed germination on similar sites in North Dakota (Hull-Sieg 1994). The Complex in cooperation with USDA is also participating in an experimental trial application of several herbicides currently not labeled for leafy spurge, followed by burning.

Trees

Riparian woodlands, planted shelter belts, and single trees are scattered throughout the Complex. The majority of these areas are associated with drainages, rivers, streams, and lake shores at Tewaukon NWR. Trees common and/or native to the area are bur oak, cottonwood, green ash, Siberian elm, and Russian olive.

Shrubs

Shrubs common to the area are western snowberry, prairie wild rose, chokecherry, and willow. The exclusion of fire has led to some shrub invasion of grassland sites primarily by western snowberry.

1.2.7 Wildlife

A variety of wildlife species are found on the Complex. The information that follows is not intended to represent or describe all species that might occur on Complex lands. A complete listing of wildlife species is found in Appendix K- Comprehensive Conservation Plan pages 114-117.

Invertebrates

Insect populations and range of occurrence of insects are not well documented at the Tewaukon Complex. It is known, however that wetlands associated within the Complex normally support high invertebrate populations. Nesting waterfowl, waterfowl broods, marsh and water birds, and

shore birds are highly dependent on these protein food sources. No Federally listed threatened or endangered invertebrate species have been documented as occurring within the Complex.

Fishes

The fisheries associated with the Complex can be described as warm-water, with low numbers of game fish and high numbers of minnows, carp, and suckers. Due to the shallow nature of the lakes and wetlands within the Complex, there is a high probability of fish winter kill.

Lake Tewaukon and Sprague Lake are stocked to provide recreational fishing. Species stocked in these lakes include: northern pike, walleye, perch, channel catfish, and tiger muskie. High numbers of carp and flathead minnows are also found in both lakes. No Federally listed fish species have been recorded on the Complex.

Reptiles and Amphibians

Approximately thirty-three species of reptiles occur in North Dakota. Of those, twenty potentially occur within the Wetland Management District.

Seventeen species of amphibians occur in North Dakota. All could potentially be found within the Complex.

No Federally listed reptiles or amphibians have been recorded on the Complex, and no detailed inventories have been conducted.

Birds

Since North Dakota was historically dominated by grassland habitat, grassland nesting birds are the predominant bird life in the state. Approximately 236 bird species are recorded as regularly occurring on the Complex. About 113 of these species nest within the Complex.

The diversity of wetlands associated with uplands in the Complex attract a great variety of shorebirds and wading birds. Many use the mud flats and shallows along the wetland edges during their migration in the spring and fall. Some species are present throughout the breeding season. Species observed include Lesser Golden Plover, American Avocet, Lesser Yellowlegs, Willet, Spotted Sandpiper, Marbled Godwit, Least Sand Piper, Pectoral Sandpiper, Dunlin, Long-billed Dowitcher, Killdeer, and Upland Sandpiper.

The wetlands on the Complex provide breeding habitat for a number of species of marsh and water birds including: Eared Grebes, Western Grebes, Pied-billed Grebes, Great Blue Herons, Black-crowned Night-herons, Egrets, White-faced Ibis, Virginia Rails, Franklin Gulls, Forster's Terns, and Black Terns. Although their breeding and presence has been recorded on the refuge, no population surveys have been conducted.

Red-tailed Hawks, Swainson's Hawks, Ferruginous Hawks, and Northern Harriers are the most common raptors using the Complex. Others using the area are the Sharp-shinned Hawk, Cooper's Hawk, Rough-legged Hawk, Golden Eagle, Prairie Falcon, Merlin, and American Kestrel. The Bald Eagle can be seen throughout the Complex, primarily along rivers and lakes as the eagles migrate through in the spring and fall. The Peregrine Falcon is occasionally observed throughout the Complex as well. Prairie raptors such as the Short-eared Owl and Burrowing Owl have decreased in number as the prairie grasslands have been converted to crop lands.

The Complex lies within the Prairie Pothole Region of North America, an area noted for producing many of the nation's ducks. Duck species that nest on the Complex include the Mallard, Gadwall, Northern Pintail, Blue-winged Teal, American Widgeon, Northern Shoveler, Wood Duck, Redhead, Canvasback, and others.

Other species such as the Canada Goose, White-fronted Goose, Snow Goose, and Tundra Swan use the area during migration.

Approximately 124 other bird species nest and/or migrate through the Complex. A number of these birds (neo-tropical migrants) winter primarily south of the United States and many have been identified as rare or declining.

The bird list developed for the Complex is listed in Appendix K-Comprehensive Conservation Plan (pg. 114).

Mammals

There are an estimated 55 mammal species found within the three-county Complex. They range in size from the tiny pygmy shrew to the white-tailed deer. Abundance varies with species, but prairie insectivores and new world species of mice common to the prairie ecosystems are very abundant.

See Appendix K-Comprehensive Conservation Plan (pg. 114) for a listing of mammal species occurring in the Complex.

1.2.8 Endangered Species

The Tewaukon Complex contains a number of threatened, endangered, and candidate species.

Table 2: Threatened, Endangered, Candidate Species Found in the Tewaukon Complex

Species	Status
Bald Eagle (<i>Haliaeetus leucocephalus</i>)	threatened
Peregrine falcon (<i>Falco peregrinus</i>)	endangered
Black tern (<i>Chlidonias niger</i>)	candidate
Ferruginous hawk (<i>Buteo regalis</i>)	candidate
Baird's sparrow (<i>Ammodramus bairdii</i>)	candidate
Loggerhead shrike (<i>Lanius ludovicianus</i>)	candidate
Regal fritillary (<i>Speyeria idalia</i>)	candidate
Dakota skipper (<i>Hesperia dacotae</i>)	candidate

Powesheik Skipper (<i>Oarisma powesheik</i>)	candidate
Western Prairie-fringed orchid (<i>Platanthera praeclara</i>)	endangered

1.2.9 Land Use

The Complex covers a three county area with a population of approximately 20,000 people. Adjacent land ownership to the Complex is almost exclusively private. The main industry in the area is agriculture and agricultural related industries. Most of Sargent and southwestern Richland Counties is crop land annually planted to wheat, barley, beans, corn and sunflowers. Large portions of the Drift Prairie region have been converted to irrigated farmland. Crops being grown include those listed for the Coteau Moraine, but also include recently introduced commodities such as dry edible beans and potatoes.

1.2.10 Values and Improvements on and Adjacent to Station

Wildfire damage to improvements on and off the Complex is a primary concern. While developments can generally be protected from fire damage, dispersed improvements, particularly fences can be damaged by fires. The Complex has office, maintenance and residence facilities at one area (total value \$2.7 million). Other improvements include 130 miles of fence valued at approximately \$5.6 million. Three predator enclosure fences within the Complex protect critical waterfowl nesting areas (approximate value of fence \$331,000). There are also Refuge entrance signs, kiosks and other improvements on the Refuge (approximate value \$70,500)

The dispersed nature of the Complex's waterfowl production areas creates situations where escaped prescribed fires or wildfires could damage adjacent private structures, equipment, and grassland and crops valued in the millions of dollars. Other property also at risk includes wooden utility poles and junction boxes which are located on or adjacent to Service lands.

1.2.11 Cultural Resources

Little of the Complex has been intensively surveyed for archeological resources, but several sites on the Refuge are well documented, especially in the Visitor Center area and on a peninsula east of it known as "The Point". A variety of stone tools and some pottery from pre-European occupation were recovered from The Point during an archeological investigation conducted in 1975. Similar tools have been uncovered from a variety of Refuge crop field sites though their locations are unrecorded. There is also a small cemetery plot dating back to the late 1800's and an Indian burial mound located several hundred yards south of the current Refuge headquarters.

There are no known historical structures that are flammable on the Complex. There is at least

one stone foundation on the Boening WPA though other tracts may have foundations as well. All of the archeological sites are likely to be covered by sod unless scattered stone artifacts were deposited on the surface when tracts were previously farmed. Due to the large amount of previously farmed land on the Complex it is likely that controlled burning may reveal evidence of sites that are primarily covered by sod (Lewis pers. comm.)

1.2.12 Intrinsic Values, Socio-Political-Economic

The overall social and economic environment can be affected by how the uplands on the Complex are managed. Often the affect is local, but when all Complex land units are combined, the affect is more widespread. Habitat management is often accomplished by authorizing local farmers to hay or graze on Complex units. This is viewed as positive both socially and economically. Local farmers and ranchers prefer to hay or graze lands on the Complex rather than seeing them burn.

The majority of neighbors accept the fact that the Federal government owns land for waterfowl production, and most have a general appreciation for the value of wildlife. However these neighbors expect the land to be managed for wildlife and not ignored. If a Complex land unit is ignored, allowing the habitat condition to decline in quality and noxious weeds to increase, opinions quickly become negative. However, if the land is managed for the best interest of wildlife and habitat conditions are maintained, their opinions are positive and wildlife benefits both on and off Complex managed lands.

The majority of recreational uses on the Complex is centered around hunting, and wildlife viewing. Many of the Complex's WPA's offer this region some very good opportunity for these pursuits. Hunters and birders come from all over the United States to visit the Complex. Occasionally hunters comment negatively when they see areas that have been burned. Negative impact to the local economy could result if habitat becomes less productive and wildlife populations decrease. The number of hunters and birders traveling to the area could decrease, depriving the local economy of recreation dollars.

Adjacent land owners generally have a low tolerance for wildfire. Except for the eastern area of the Complex (Richland County), the use of prescribed fire is generally fairly well accepted as habitat management tool in most areas of the Complex. The Complex relies on local landowners and the public to notify us when there is a fire on Complex holdings. In many cases we are the last to find out if a fire occurs on a distant WPA.

1.3 Historical/Ecological Role of Fire

Wildland fire is one of the natural processes that has been documented to have an major influence on grassland ecosystems and is one of the primary natural forces which maintained the native prairie. Prior to the arrival of European man, the grasslands of southeastern North Dakota were a mix of native warm and cool season grasses and forbs. Numerous indigenous plant and wildlife species existed on the seemingly endless prairie. The processes which maintained the vegetative and dependant wild life included fire (Higgins et al. 1989), periodic defoliation by large herds of grazing ungulates (buffalo), and weather (Eldridge 1992, Barbour et al. 1987).

Fires ignited by lightning and human often burned millions of acres as there were few natural fuel breaks and no suppression. The role of fire in the northern plains had been one of continued restoration of the prairie ecosystem. Fire restored vigor to plant growth, increased seed production, released nutrients, and reduced accumulated litter. Wright (1978) and others believe that the natural fire frequency in the prairie grasslands is on the order of 5-10 years. Other studies indicate that a longer frequency of 10-20 years may be more accurate.

Since the early 20th century and the establishment of the Complex in 1943, nearly all fires within the Complex boundaries have been suppressed. Most of the Refuge and adjacent District grassland habitat has a history of fragmentation due to agricultural practices and the majority of the grassland habitat on the Complex consists of re-seeded mixes of grasses. These changes have significantly reduced the role fire plays as a vital element of the prairie ecosystem. In more recent years there has been an accumulation of knowledge, now being translated into management practices, which recognizes fire as an essential component of grassland management.

The role of wildland fire is particularly important for native grasslands, but is also an important tool for managing uplands that have been re-seeded to grass. One of the simplest and least expensive practices to improve and restore grassland structure and diversity is prescribed burning. Selective suppression or promotion of a particular species depends on the date of the fire in relation to the phenology of the particular species (Higgins, Kruse, Piehl 1989). Large wildfires could have negative effects on certain grass species depending on the time of year and drought conditions. Prescribed fires, appropriately timed are used to manage Complex grasslands. Research conducted found a marked increase in species diversity after prescribed burning (Kirsch and Kruse 1972).

Wildland fire can increase the spread and density of some noxious weeds depending on several environmental and phenological factors. For example Canada thistle rapidly invades planted warm season fields following a previous fall burn. However, early spring burning on planted natives can stimulate thistle flushes which can be controlled more easily by other means at the rosette stage. Initial results of late fall burning for control of wormwood sage at nearby Audubon NWR, North Dakota, have also been very positive (Hultburg, personal conversation).

While bur oak regeneration around Lake Tewaukon may be declining due in part to fire exclusion, Russian olive, a non-native, is increasing. Control of Russian olive trees with prescribed fire can be effective if the trees are very young.

Insect populations and range of occurrence of insects are not well documented at the Tewaukon Complex. Fire causes an immediate decrease in insect populations (except ants, other underground species, and flying insects), followed by a gradual increase in numbers as the vegetation recovers. The insects eventually reach a population level higher than adjacent areas, then decline to near present levels as vegetation and soil litter stabilize (Higgins, Kruse, and Piehl 1989).

Bird species evolving with fire may show fire adapted behavior and responses, whereas other

species exposed infrequently to fire in their evolutionary history may be severely inhibited by it (Best 1979). Research conducted at the Arrowwood Complex from 1969-1971 concluded a greater variety of nesting bird species were found on burned areas, duck and sharptail grouse production was higher on burned areas, hatching success of ducks was higher on burned areas, and there was a marked increase in plant variety after burning (Kirsch and Kruse 1972). In Saskatchewan, Maher (1973) found one of the highest breeding bird densities recorded in any treatment during his study on burned grasslands 2 years after the burn. Other study results suggest that vegetation structure and duck nesting response to spring and fall burns became similar after the third post fire growing season (Higgins 1986).

More detailed information concerning the effects of fire on wildlife can be reviewed in The Effects of Fire in the Northern Great Plains, prepared by Higgins, Kruse, and Piehl.

1.4 Refuge Fire History

Fire records of the Complex exist from 1964 to present, however more detailed records exist from 1989 to the present with the use of the DI-1202 report form. Very detailed descriptions and maps of the fires size, location, and fuel types are now kept in the files. With the use of GPS technology exact locations of fires, fire origins, and study plots can be recorded for future use. Tewaukon Complex has an average of 1 wildfire per year. Human caused ignitions account for approximately 68% of all recorded fires. Approximately 13% of the fires were caused by lightning. Research indicates lightning-caused fires are less frequent in the eastern portion of North Dakota (Higgins 1984). 19% of the fires are of unknown cause. A complete listing of wildland fires for the Complex can be found in Appendix A).

Table 3: Summary of Wildland Fire History - 1967-1998

Cause	Number	Acres	Average
Human	21	444.1	21.1 acres
Lightning	4	1.5*	>1.0 acres
Unknown	6	271.0	45.2 acres
Totals	31	716.6	23.1 acres

* No acreage amounts were reported for three of the four fires that occurred in 1988.

Equipment and agricultural field burning account for the majority of human-caused starts. The agricultural field burning season occurs during spring and fall, and is widespread throughout the Complex. Private landowners are not subject to the same burning regulations as government agencies. Farm fields are often ignited and left unattended, sometimes resulting in wildfires.

All fires on record were controlled during the first burning period. Many of the wildfires were suppressed with the help of volunteer fire department resources or solely by volunteer fire departments.

The earliest records of managing habitat with prescribed fire were in 1968 (Tewaukon Refuge Narrative 1968).

2.0 POLICY COMPLIANCE - GOALS AND OBJECTIVES

2.1 Compliance with Service Policy

U.S. Fish and Wildlife Service policy requires that an approved Fire Management Plan must be in place for all of Service lands with burnable vegetation. Service Fire Management Plans must be consistent with firefighter and public safety, protection values, and land, natural, and cultural resource management plans, and must address public health issues. Fire Management Plans must also address all potential wildland fire occurrences and may include the full range of appropriate management responses. The responsible agency administrator must coordinate, review, and approve Fire Management Plans to ensure consistency with approved land management plans.

Service policy allows for a wildland fire management program that offers a full range of activities and functions necessary for planning, preparedness, emergency suppression operations, emergency rehabilitation, and prescribed fire operations, including non-activity fuels management to reduce risks to public safety and to restore and sustain ecosystem health.

2.2 NEPA Compliance Statement

This plan is a step down plan from the Tewaukon Comprehensive Conservation Plan (CCP) (Appendix K). The CCP describes the history of the Complex, the various habitats, and the management tools and strategies used to maintain and improve them. Through the CCP development process, fire management was determined to be an important component of the strategy developed to achieve resource management objectives for the Complex. The use of fire and its effects and the goals to be achieved through the use of this tool are also described in the CCP. Enhanced management, the preferred alternative described in the CCP includes the use of prescribed fire to enhance vegetative and wildlife diversity and deter the encroachment of established cool season exotic grasses. The use of a variety of upland management techniques, including fire and the relationship of these tools to the National Environmental Policy Act (NEPA) and National Historic Preservation Act (NHPA) is found in Appendix F of the CCP.

This plan addresses the role of fire on Complex grasslands in more detail and provides direction for the prescribed and wild fire management program at the Tewaukon Complex. The Plan also satisfies a Service requirement that all refuges with vegetation capable of supporting fire develop a plan.

2.3___Authorities Citation

Authority and guidance for implementing this plan are found in:

- G 42 Stat. 857;16 U.S.C. 594, Protection Act of September 20, 1922.
- G 47 Stat. 417; 31 U.S.C. 315, Economy Act of June 30, 1932.
- G 69 Stat.66.67;42 U.S.C. 1856, 1856 a and b, Reciprocal Fire Protection Act of May 27, 1955.
- G 16 U.S.C. 668 dd-668 ee, National Wildlife Refuge System Administrative Act of 1966, as amended.
- G 88Stat. 143; 42 U.S.C. 5121, Disaster Relief Act of May 22, 1974.
- G 88 Stat. 1535; 15 U.S.C. 2201, Federal Fire Prevention and Control Act of October 29, 1974
- G Pub. L. 95-244, as amended by Pub. L. 97-258, September 13, 1982. 96 Stat. 1003 31 U.S.C. 6301-6308, Federal Grants and Cooperative Act of 1977.
- G 96 Stat.837, Supplemental Appropriation Act of September 10, 1982

- G Pub. L. 100-428, as amended by Pub. L. 101-11, April, 1989, Wildfire Assistance Act of 1989
- G Department of Interior Departmental Manual, Part 620 DM-1, Wildland Fire Management (April 10, 1998)

2.4 Other Regulatory Guidelines

Fire Management activities within the Refuge will be implemented accordance with the following regulations and directions:

- G Departmental Manual Part 519 (519DM)
- G Code of Federal; Regulations (36CFR 800)
- G The Archaeological Resources Protection Act of 1979
- G The Archaeology and Historical Preservation Act of 1974, as amended
- G National Historic Preservation Act of 1966
- G The Endangered Species Act of 1973, as amended
- G The Provisions of the Clean Air Act, as amended 1990

2.5 Enabling Legislation and Purpose of Refuge (Mission Statement)

The Tewaukon Complex consists of two administrative units, Tewaukon National Wildlife Refuge (NWR) and Tewaukon Wetland Management District (WMD).

Tewaukon NWR was established in 1943 by Executive Order as a refuge and breeding ground for migratory birds and other wildlife. The District consists of small fee title tracts or Waterfowl Production Areas to be managed for waterfowl production.

Three easement refuges are also included in the Complex. The establishing legislation for these tracts directs that they be managed as rest areas for migratory birds and other wildlife including management of natural or artificial lakes. The Service does not hold title to any lands in these refuges and has no upland management responsibilities them.

Wetland and FMHA easements are also administered from the Complex and the Service has no upland management responsibilities on these tracts other than to ensure that landowner activities carried out on these sites are compatible with the purpose for which they were acquired. At the request of the landowner the Service may issue permits for fire management to be used and which stipulates the season, but has no further authority to require additional parameters.

The legislation which established Tewaukon NWRC directed it be managed:
“...as a refuge and breeding ground for migratory birds and other wildlife...”

For lands acquired under the Migratory Bird Conservation Act, U.S.C. ss 715d, as amended, the purpose of the acquisition is “...for uses as an inviolate sanctuary, or for anyother management purpose, for migratory birds.”

2.6 Overview of Planning Documents

The Comprehensive Conservation Plan was completed in June 2000, and is the final and referenced document for Tewaukon NWR (Appendix K). A Finding of No Significant Impact was signed by the Acting Regional Director on September 27,2000. As indicated previously, the Comprehensive Conservation Plan addresses wildland fire management and the use of prescribed fire to accomplish resource management objectives.

2.7 Land Management Goals and Objectives

Complex goals and objectives as described in the Refuge Master Plan and District Objective Statement include: managing upland habitat for nesting and feeding migratory birds, public use and recreation, and optimizing abundance and diversity of wildlife and plant species (CCP pp 26-82). The Complex goals and objectives are described in the Comprehensive Conservation Plan.

The primary goals identified in the Comprehensive Conservation Plan(Appendix K):

Goal: Preserve, restore, and enhance the ecological diversity of native flora, other grasslands and wetlands within the tall grass prairie - wetland ecosystem

Goal: Preserve, restore, and enhance the ecological diversity and abundance of migratory birds and other native wildlife with emphasis on waterfowl, grasslands, and wetland dependent birds.

Goal: Contribute to the preservation and restoration of endangered, threatened, rare, and unique flora and fauna that occur, or have historically occurred in the complex area.

Two Wildland Fire related Objectives identified in the CCP (Appendix K) are:

Objective: Utilize prescribed fire, in an ecosystem management context, applied in a scientific

way under selected weather and environmental conditions, on approximately 5,000 acres of grasslands and 200 acres of wetland annually to accomplish habitat management objectives.

Objective: Protect life, property, and other resources from wildfire by safely suppressing all wildfires on Complex lands.

3.0. REFUGE FIRE MANAGEMENT OBJECTIVES

The goal of wildland fire management is to plan and make decisions that help accomplish the mission of the National Wildlife Refuge System. That mission is to administer a national network of lands and waters for the conservation, management, and, where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans. Fire management objectives (standards) are used in the planning process to guide management to determine what fire management responses and activities are necessary to achieve land management goals and objectives.

The primary goal is to provide for firefighter and public safety, property, and natural resource values. Service policy and the Wildland Fire Policy and Program Review direct an agency administrator to use the appropriate management strategy concept when selecting specific actions to implement protection and fire use objectives. The resulting Appropriate Management Response are specific actions taken in response to a wildland fire to implement protection and fire use objectives. With an approved Fire Management Plan, the Refuge staff may use wildland fire in accordance with local and State ordinances and laws to achieve resource management objectives (habitat improvement).

3.1 Habitat Management Goals and Objectives

The following considerations influenced the development of the Complex's fire management goals and objectives. The previous sections of this plan have established that:

- G Fire is an essential natural part of the Complex's native biotic communities.
- G Uncontrolled wildfire has the potential for negative impacts on and off the Complex.
- G Positive or negative effects of prescribed fire on vegetation, wildlife, and cultural resources depend on burning conditions and plant phenology.
- G Rapid rates of spread, potentially long response times, and the large number of individual land units (WPA's) pose suppression problems and increase the likelihood of escape onto adjacent lands.

3.2 Fire Management Goals and Objectives

In addition to the two objectives identified in the CCP (pg.48), Complex Fire Management Objectives include:

- G Safely suppress all wildfires using strategies and tactics appropriate to safety considerations and values at risk.
- G Minimize the impact and cost of fire suppression.
- G To provide an opportunity for public education and interpretation of how prescribed fire can be used to manage wildlife habitat.
- G Use prescribed fire to restore and perpetuate native wildlife species, by maintaining a diversity of plant communities.
- G Protect archeological sites around the Complex such as the area known as The Point and the Indian burial mound.
- G Improve habitat for endangered and threatened species.

4.0 FIRE MANAGEMENT STRATEGIES

4.1 Implementation Strategies

- G Using the Appropriate Management Response concept, suppress all wildfires in a safe and cost effective manner consistent with cultural and natural resources and public and private values at risk. Minimum impact strategies and tactics will be used when possible.
- G Conduct all fire management programs in a manner consistent with applicable laws, policies and regulations.
- G Due to the wide-spread land holdings of the Complex (3 counties, 103 units), reporting of fires by local landowners and the public will be needed for fire detection in remote areas of the Complex. Complex initial attack equipment and Range Technician firefighters will maintain a maximum response time of one hour to fires on the Tewaukon Complex area during the fire season. A cooperative agreement with the Rutland-Cayuga Fire Department will be maintained to provide for cooperative suppression actions and ensure reimbursement is appropriately made.
- G Utilize prescribed fire as a management tool for achieving hazard fuel and resource management objectives. To the greatest extent possible, hazard fuel prescribed fires will be used only when they can compliment resource management objectives. Resource management prescribed fire will be used to accomplish specific objectives established for individual land units.
- G Initiate cost-effective fire monitoring which will tell managers if objectives are being met. Monitoring information will also be used to refine burn prescriptions to better achieve objectives.
- G All buildings, kiosks, and other structures of value will have a mowed fire break around them and dangerous fuel loadings removed.

4.2 Limits to Implementation Strategies

- G The resource benefits derived from wildland fire will not be considered when determining the appropriate management response to suppress a wildfire.
- G Use of the "light on the land" concept to minimize environmental damage is important throughout the Complex, and especially on the Hartleban WPA where several threatened, endangered, and candidate species inhabit the area (i.e., Western Prairie-fringed orchid, Dakota Skipper, Regal fritillary).
- G Heavy equipment (dozers, discs, plows, and graders) will not be used for fire suppression except in life threatening situations without the express approval of the Complex Manager.
- G Smoke management will be carefully considered for all prescribed burns and will be addressed in all prescribed burn plans.
- G All fires occurring on the Refuge will be staffed or monitored until declared out.
- G Prescribed burning in areas where threatened, endangered, and candidate species exist will not be conducted if the prescribed fire will be detrimental to the species or any adverse impacts cannot be mitigated, Section 7 clearance will be secured, as appropriate.
- G The use of prescribed fire to achieve management objectives must be conducted in a cost effective manner.
- G Aerial Retardants and foams will not be used within 300 feet of any waterway as described in the Guidelines for Aerial Delivery of Retardant or Foam near Waterways.

4.3 Impacts on Neighboring Lands

The dispersed nature of the Complex's waterfowl production areas creates situations where escaped prescribed fires or wildfires leaving Service lands could damage adjacent private structures, equipment, and grassland and crops valued in the millions of dollars.

Failure to manage Service lands could have an adverse effect on relationships between the Refuge staff and area residents. Local residents expect the Service to manage the lands within the Complex in a manner that produces ducks and wildlife as intended. Lands that are not properly managed as seen as sources of noxious weeds and a waste of taxpayer's money.

This topic is discussed in more depth in section 10.1.

5.0 FIRE MANAGEMENT RESPONSIBILITIES

5.1 ___ Refuge Staff Responsibilities

The Complex uses a Fire Management Team approach to plan and implement the fire management program. Principal members of the Complex fire planning organization are the Complex Project Leader, Complex Manager, Fire Management Officer, and the Complex Biologist. The Project Leader is responsible for planning and implementation of an effective and the safest possible fire management program at the Refuge. The Project Leader is also ultimately responsible for all fire management decisions related to both wildfire and prescribed fire in the Refuge.

Wildfire assignments are made on the basis of individual qualifications and position requirements. The fire job responsibilities in the Fire line Handbook and the ones described for the positions below are to be fulfilled. A listing of staff and their qualifications can be found in Appendix E.

5.1.1 Project Leader

- G Responsible for the overall management of the Refuge including fire management.
- G Insures fire management policies observed.
- G Fosters effective cooperative relations within the refuge, cooperating fire organizations, and adjoining land owners.
- G Within budgetary restraints, insures sufficient collateral duty firefighters meeting Service standards are available for initial attack.
- G Supervises the resource management activities on land management units within the Complex, making final determination of projects to be accomplished.
- G Approves individual prescribed fire plans.
- G Serves as collateral duty firefighter, as qualified.

5.1.2 Fire Management Officer

- G Supervises the Complex fire management staff.
- G Insures fire management policies are observed.
- G Prepares annual Fire Base budget request, approves and tracks use of Fire Base Accounts.
- G Has lead responsibility for managing the prescribed fire program including:
 - # Proposes annual hazard fuel reduction and resource management prescribed fire projects.
 - # Writing prescribed burn plans and reviewing similar plans written by others.
 - # Serves as Prescribed Burn Boss, as available.
- G Maintains liaison with Regional Fire Management Coordinator and Zone Fire

Management Officer.

- G Coordinates updates to the Fire Management Plan, maintenance of fire records, and reviews fire reports for accuracy and completion.
- G Responsible for the planning, coordinating, and directing pre-suppression activities.
- G Coordinating with cooperative agencies on a regional level, revising cooperative agreements as necessary.
- G Serves as a firefighter, as qualified.

5.1.3 Fire Program Technician

- G Supervises seasonal firefighters.
- G Assist with the planning, coordinating, and directing pre-suppression activities.
- G Responsible for planning and coordinating preparedness activities including:
 - # The Refuge fire training program.
 - # Physical fitness testing and Interagency Fire Qualification System (IFQS) data entry.
 - # Insuring that all seasonal firefighters are Red Carded on or within 2 weeks of their Enter On Duty date.
 - # Insuring that all seasonal and collateral duty firefighters Personal Protective Equipment is properly worn and meets current standards.
 - # Maintaining a current fire cache and equipment inventory and is responsible for keeping all equipment in a constant fire readiness.
 - # Insuring the Step-up Plan is followed.
- G Maintains fire weather station operation and the collection and distribution of data.
- G Assist Fire Management Officer with updating the Fire Management Plan and maintaining accurate fire records.
- G Assists Fire Management Officer with all issues related to the fire management program including:
 - # Monitoring rangelands conditions before and after prescribed burns
 - # Selecting units that are in need of treatment with prescribed fire.
 - # Coordinating with cooperating fire agency.
 - # Assisting in the preparation of annual Fire Base budget request.
- G Coordinates and presents fire safety meetings when needed.
- G Serves as a firefighter, as qualified.
- G Serves as Prescribed Fire Burn Boss, as qualified

5.1.4 Biologist

- G Coordinates fire monitoring program to determine if management ignited prescribed fires accomplish stated objectives.
- G Reviews all proposed units to be burned to ensure sound biological principles are being followed, resource management objectives are valid, and sensitive resources are not being negatively impacted.
- G Provide technical/biological support to managers in selecting appropriate resource objectives and the best tool to use in accomplishing selected objectives, including prescribed fire.
- G Serves as collateral duty firefighter, as qualified.
- G Serves as Prescribed Fire Burn Boss, as qualified

5.1.5 Maintenance Worker

- G Maintains engine(s) in a state of readiness.
- G Supervises and trains assigned engine crew, as qualified.
- G Serves as collateral duty firefighter, as qualified.

5.1.6 Administrative Officer

- G Completes all necessary administrative documents associated with fire management activities.

5.1.7 Seasonal and Collateral Duty Firefighters

- G Responsible for their own fire records, equipment, and physical conditioning.
- G Qualifies annually by completing the appropriate fitness test between March 15-30, or within 2 weeks of EOD date.
- G Maintains assigned fire equipment in ready state and using all safety gear assigned.
- G Assists the Fire Management Officer in maintaining accurate fire records.
- G Serves as a firefighter, as qualified

5.1.8 Wildfire Incident Commander (as assigned)

- G The Incident Commander (IC) is responsible for the safe and efficient suppression of the assigned wildfire.
- G Fulfills the duties described for the IC in the Fire line Handbook
- G Notifies the FMO or Dispatcher of all resource needs and situational updates, including the need for extended attack

- G Ensures wildfire behavior is monitored and required data is collected, and that assigned resources are briefed on the strategy and tactics to be used, expected fire behavior, historic weather and fire behavior patterns, impacts of drought, live fuel moisture, escape routes and safety zones, and radio frequencies to be used.
- G Ensures personnel are qualified for the job they are performing
- G Identifies and protects endangered and threatened species and sensitive areas according to the Fire Management Plan.
- G Utilizes Minimum Impact Suppression Tactics to the fullest extent possible.
- G Ensures fire is staffed or monitored until declared out.
- G Ensures that the fire site is fully rehabilitated or that management is notified that rehabilitation is required.
- G Submits completed DI-1202 (wildfire report), Crew time sheets, a listing of any other fire related expenditures or losses to the FMO, and completes task books within 3 days of fire being declared out.

5.1.9 Prescribed Burn Boss (as assigned)

- G Writes or reviews prescribed burn prescriptions for assigned blocks
- G Implements approved prescribed burn plans.
- G Assist with the administration, monitoring, and evaluation of prescribed burns.
- G Submits completed DI-1202 (wildfire report), Crew time sheets, a listing of any other fire related expenditures or losses to Administrative Officer, and completes taskbooks within 3 days of fire being declared out.

5.2 Cooperator involvement

Along with other land management agencies, the Service has adopted the National Interagency Incident Management System (NIIMS) Wildland and Prescribed Fire Qualification Subsystem Guide, PMS 310-1 to identify minimum qualification standards for interagency wildland and prescribed fire operations. PMS 310-1 recognizes the ability of cooperating agencies at the local level to jointly define certification and qualification standards for wildland fire suppression. Under that authority, local wildland fire suppression forces will meet the standards established for their agency or department. All personnel participating in prescribed fire management activities must meet Service fitness and training standards. All fire agreements can be found in Appendix C.

6.0 FIRE SEASON

6.1 Refuge Fire Frequency

The Tewaukon Complex averages 1 wildfire per year. The average size of fires occurring on the Complex is approximately 23 acres. More details can be found in Section 1.4 - Refuge Fire History

6.2___Refuge Fire Season

Green up of cool and warm season grasses is dependent on precipitation and soil moisture. Drought years often produce little or no green-up for the entire year. Year to year variations in green up and curing of grasses affect fire danger throughout the growing season. As a result, the season can vary from year to year. For planning purposes, the Complex's fire season has been determined using the Fire Base analysis completed at Arrowwood NWR located about 100 miles NW of Tewaukon. Their season is 130 days long, running from April 1st to June 9th and from August 9th to October 7th. Tewaukon's is similar.

7.0 EQUIPMENT AND STAFFING NEEDS

7.1 Normal Unit Strength

7.1.1 Equipment and Supplies

Engines are the primary initial attack resource on the Complex because of the predominance of fine fuels. Because of the large number of wetlands and soils that can be very wet during the spring of the year and after periods of heavy rainfall, engines maybe ineffective in some areas. Firefighters still need to get to a wildland fire with enough gear and equipment to stay on the fire line for several hours. All Terrain Vehicles (ATV) equipped with small water tanks and pumps are available and can go to most places where engines can not. These can be used for fire suppression and also to ferry in other equipment and supplies needed for fire suppression. Earth moving equipment is available but not recommended for use due to resource damage concerns.

All Firefighters will be issued the required personal protective equipment. All primary engines will be equipped with tools, firing devices, and water handling accessories. A 20-person cache will be maintained at Refuge Headquarters.

A complete listing of fire equipment and supplies can be found in Appendix D.

7.1.2 Personnel and Level of Qualifications____

The Fire Management Officer and Fire Program Technician will be minimally qualified as Single Resource Bosses and as Prescribed Burn Boss 3 (RXB3). If they are not at that level, they will be given the training and experience necessary to become qualified at that level.

The Complex will, within the limits of available funding, maintain a seasonal engine crew during the fire season. The Career Seasonal Range Technician will serve as the Engine Boss (ENGB) when appropriate. Fire crew members will be qualified at the Firefighter Type 2 (FFT2) level for fire suppression. Additional firefighters may be temporarily positioned at the Complex, or existing fire crew seasons may be extended using severity or emergency pre-suppression funding when very high or extreme fire conditions warrant.

The Complex will at minimum meet policy requirements of the Service prescribed fire qualification system. The Fire Staff will be responsible for ensuring Complex personnel maintain qualifications necessary to implement the growing fire program.

The Biologist will take the lead in monitoring fire effects with assistance from fire staff.

Table 4 lists the minimum fire qualification levels that will be maintained at the Tewaukon Refuge Headquarters.

Table 4: Target Positions and Qualifications

Position	Wildland Fire	Prescribed Fire
Collateral Duty Fire Fighter (FFT2)	1	4
Seasonal Fire Fighter (FFT2)	4	4
Engine Operator (ENOP)	1	2
Single Resource Boss (ENGB)	2	2

Initial Attack Incident Commander (ICT5)	2	
Prescribed Burn Boss (RXB3)		2
Fire Monitor		1

Note: A firefighter can be qualified for more than one position.

8.0 PREPAREDNESS

8.1 Current Staff Available to meet Position Needs

Appendix B contains the current staffing levels and the Employee Contact List.

8.2 Preparedness Activities

8.2.1 Annual Refresher Training

The safety of firefighters and the public is the first priority. Persons engaged in fire suppression activities are exposed to a high element of risk. The Project Leader and fireline supervisors must make every effort to reduce the exposure to risk and enhance performance. One way is through formal and on-the-job training and improved physical fitness. The Service has adopted the training and fitness standards established in 310-1, and all firefighters must meet these and other standards established by the Service to participate in fire management activities.

The Regional Office will pay for all approved wildland fire training if the following criteria are met:

- G Participant completes and submits to the Zone FMO a National Wildfire Coordinating Group Interagency Training Nomination Form (NFES 2131), complete with supervisory approval and an estimated cost of training, travel and per diem prior to the commencement of training.
- G The training is approved by the District and Zone Fire Management Officer. Upper level courses may require concurrence of the Regional Fire Coordinator.
- G On completion of the training, a copy of the Certificate of Completion will be sent to the Zone FMO and a copy of the travel voucher will be sent to the Fire Program Assistant in the Regional Office.

All personnel involved in Fire Management activities are required to participate in annual wildland fire management refresher training in order to be qualified for fire management activities in that calendar year. Refresher training will concentrate on local conditions and factors, the Standard Fire Orders, LCES, 18 Situations, and Common Dominators. NWCG courses Standards for Survival, Lessons Learned, Look Up, Look Down, Look Around, and others meet the firefighter safety requirement; but, efforts will be made to vary the training and use all or portions of other NWCG courses to cover the required topics. Fire shelter use and deployment under adverse conditions, if possible, must be included as part of the annual refresher.

8.2.2 Physical Fitness

All personnel involved in fire management activities will meet the fitness standards established by the Service and Region. At this point in time, firefighters participating in wildfire suppression must achieve and maintain an Arduous rating. Firefighters participating in Prescribed Burns must achieve and maintain a Moderate rating. Information found in Appendix H provides specific instructions to administer the tests, a health screening questionnaire to aid in assessing personal health and fitness of employees prior to taking the test, an informed consent form, and safety considerations. A trained and qualified American Red Cross First Responder (or equivalent) who can recognize symptoms of physical distress and appropriate first aid procedures must be on site during the test.

Wildland fire fitness tests shall not be administered to anyone who has obvious physical conditions or known heart problems that would place them at risk. All individuals are required to complete a pre-test physical activity readiness questionnaire prior to taking a physical fitness test. They must read and sign the Par-Q health screening questionnaire, an informed consent form (Appendix E). If an employee cannot answer NO to all the questions in the PAR-Q health screening questionnaire, or is over 40 years of age, unaccustomed to vigorous exercise, and testing to achieve a Moderate or Light rating, the test administrator will recommend a physical examination. As noted below, all individuals over 40 years of age must receive an annual physical prior to physical testing.

8.2.3 Physical Examinations

In keeping with Service Policy, a physical examination is required for all new permanent employees and all seasonal employees assigned to arduous duty as fire fighters prior to reporting for duty. A physical examination may be requested for a permanent employee by the supervisor if there is a question about the ability of an employee to safely complete one of the work capacity tests. All permanent employees over 40 years of age who take the Pack or Field Work Capacity Test to qualify for a wildland or prescribed fire position are required to have an annual physical examination before taking the test. The cost of the examination will be borne by the Service and the results sent to the Region's Personnel Department.

8.2.4 Drought Indicators and Other Impacts on Station Activities

As indicated previously, periods of drought can greatly impact fire behavior and resistance to suppression. For that reason the North Dakota Rangeland Fire Danger Index, Palmer Drought Index, and the Keetch-Byrum Drought Index will be monitored at a minimum on a weekly bases throughout the year. All are available on the Internet at <http://ndc.fws.gov>. The Refuge fire staff can also contact the North Dakota Interagency Dispatch Center (701-768-2552) during periods of high fire danger to track indices and anticipate possible fire activity. Preparedness actions have been identified in the Step-Up Plan to respond to unusual conditions associated with drought and other factors (Appendix F).

As a general guide, a severe drought is indicated by a Palmer Drought Index reading of - 4.0 or less or a Keetch-Byrum Drought Index of 600 or greater and a long-range forecasts calling for below average precipitation and/or above average temperatures. Drought Indices can also be accessed at: <http://www.boi.noaa.gov/fwweb/fwoutlook.htm>

Large scale fire suppression activities occurring in various parts of the country can have an impact on local fire management activities. For example, resources may be limited to implement prescribed fire activities because the closest available resources may be assigned to fire suppression duties or Refuge personnel may be involved as well. Regional drought conditions may also tie-up local resources that would normally be able to assist with Refuge fire management activities. It may be necessary to go out of Region to get the resources needed to staff the Refuge engine during periods of extreme drought or high fire danger.

The Refuge is in the Northern Rockies Area. During National and Regional Planning Levels IV and V, it is necessary to receive approval from the Regional Fire Management Officer and the concurrence of the Northern Rockies Area Coordination Group to conduct prescribed burns during PL IV and the National Coordination Group during PL V.

8.2.5 Step-Up Plan

The step-up plan will be a guide for pre-suppression operations throughout the Complex and for the requesting of emergency pre-suppression funding. The plan uses the National Fire Danger Rating Systems (NFDRS) Burning Index to determine fire danger from weather indices gathered from a remote weather station located near the Tewaukon Complex headquarters.

The Tewaukon Fire Staff will monitor current weather and fuel conditions, consult predicted fire weather reports, and track the Rangeland Fire Danger Index and the Keetch-Byram Drought Index in order to take appropriate actions as listed in the Step-Up Plan (Appendix F).

8.2.6 Severity and Emergency Pre-suppression Funding

Severity funding is different from Emergency Presuppression funding. Emergency Presuppression funds are used to fund activities during short-term weather events and increased human activity that increases the fire danger beyond what is normal. Severity funding is requested to prepare for abnormally extreme fire potential caused by unusual climate or weather events such as extended drought. Severity funds and emergency presuppression funds may be used to rent or preposition additional initial attack equipment, augment existing fire suppression personnel, and meet other requirements of the Step-up Plan.

Emergency Presuppression and Severity funds will be requested in accordance with the guidance provided in the Service's Fire Management Planning Handbook. As a general guide, Severity funding will be requested if a severe drought is indicated by a Palmer Drought Index reading of -4.0 or less or a Keetch-Byram Drought Index of 600 or greater and a long-range forecast calling for below average precipitation and/or above average temperatures.

9.0 WILDFIRE PROGRAM

9.1 Special Safety Concerns and Firefighter Safety

Safety of Service employees and cooperators involved in fire management activities is of primary concern. Only trained and qualified employees will be assigned to fire management duties. All fire management personnel will be issued appropriate Personal Protective Equipment and will be trained in its proper use. No Service employee, contractor or cooperator will be purposely exposed to life threatening conditions or situations except when necessary to save the life of another person.

The primary threat to firefighter safety is from fast moving, wind-driven wildfires that can quickly over take and trap firefighters. Due to terrain, soil conditions, and the location of various wetlands and water courses, it may be difficult for an engine to out-run a fast moving fire. It is important that firefighter practice LCES **at all times!** Spot weather forecasts should be requested early-on during initial attack to gain insight into the possibility of shifting winds from thunderstorms approaching fronts, and other weather related phenomena.

The Goals and Objectives of the Refuge Safety Plan will be incorporated into all aspects of fire management. The Fire Management Plan will provide direction to accomplish safety objectives listed below during wildfire suppression actions and prescribed fire activities.

- G Provide safe working conditions for employees.
- G Provide safe environments for the visiting.
- G Protect and insure safety of government equipment.
- G Define equipment available and:
 - # identify responsibilities.
 - # identify sources of resources.
 - # provide documentation.
 - # promote a healthy safety attitude.

Smoke from wildfires and prescribed fires is recognized health concern for firefighters. Prescribed burn bosses and wildfire incident commanders must plan to minimize exposure to heavy smoke by incorporating the recommendations outlined in the publication Health Hazards of Smoke (Sharkey 1997).

9.2 Prevention Program

Human caused fire is the most frequent cause of wildfires on the Refuge and needs to be strongly addressed. In the past 10 years 68% of the wildfires on the Refuge are known to be human caused with over half relating to agricultural activities. Human caused fires are the hardest to predict when they will occur. Unlike lightning caused fires which usually occur during certain times of the year and usually during storms, human caused sources of ignition can happen anytime of the year and anytime of the day.

As part of the fire prevention program at the Refuge fire prevention will be discussed at scheduled fire safety meetings, tailgate meeting held as part of prescribed and wildfires operations, and at times and places deemed appropriate by the fire staff prior to the fire season

and during periods of high fire danger.

For the most part the local public and most visitors to the Refuge practice basic fire prevention strategies. Signs have been posted to inform the public that no open fires are allowed on the Refuge.

During periods of high or extreme fire danger certain activities maybe restricted and/or access to the Refuge maybe closed. The public will be informed by notices posted at entrances and through the local media. All State regulations and restrictions will be enforced.

All Refuge trails will be mowed and firebreaks will be maintained to help prevent or control wildfires.

Public education can be done through the media, school programs, and incidental contact with the public.

9.3 ___Detection

The Complex relies on neighbors, visitors, staff, and cooperators to detect and report fires. In addition, the step up plan provides for increased patrols by refuge personnel during periods extreme fire danger.

There may be occasions when unqualified personnel discover a wildland fire. When this occurs, the employee should report the fire and request assistance before taking action to suppress or slow the spread of the fire. If the fire poses an imminent threat to human life, the employee may take appropriate action to protect that life before requesting assistance. The unqualified personnel will be relieved from direct on-line suppression duty or reassigned to non-fire line duty when qualified initial attack forces arrive.

9.4 Initial Reporting and Dispatching

All fires occurring within or adjacent to the Tewaukon Complex are to be reported to the Refuge headquarters or the Complex FMO within 24 hours. The person receiving the report of an active wildfire will be responsible for implementing the Fire Dispatch Plan (Appendix G).

Requests for assistance from cooperators on fires not threatening the Refuge must be made to and approved by the Complex FMO or Project Leader. Only qualified and properly equipped resources will be dispatched off-refuge fires. In general, we will assist within protection boundaries which is a 1 mile radius of refuge boundaries.

The North Dakota Dispatch Center (701-768-2552) will be contacted for coordinating the filling and delivery of any interagency resources made by the IC including engines, tools, supplies, and meals. The Complex FMO or Project Leader will be responsible for local resource that are

requested by the IC. The IC will place all resource orders through the CFMO or the Project Leader, and will specify what is needed, and when and where it is needed. The CFMO or Project Leader will promptly determine if the resource orders can be filled or procured locally and notify the IC.

9.5 Fire Suppression

Tewaukon Complex is a full suppression area. All suppression efforts will be directed towards safeguarding life and property while protecting the Refuge's resources and other values at risk from harm in an efficient and cost-effective manner.

9.5.1 Initial Attack Strategies and Tactics

For fires occurring on Refuge property, Service policy requires the Refuge utilize the ICS system and firefighters meet Service qualifications or qualifications established by their department or agency. All fires occurring on the Refuge and staffed with Service employees will be supervised by a qualified incident commander (IC). If a qualified IC is not available, one will be ordered through the Zone FMO or the North Dakota Interagency Dispatch Center(701-768-2552). Until the IC arrives, the highest qualified firefighter will assume the duties of the IC until relieved by a qualified IC or the fire is suppressed. The IC will receive general suppression strategy from the Fire Management Plan, but appropriate tactics used to suppress the fire will be up to the IC to implement. Minimum Impact Suppression Tactics should be used whenever possible.

The Incident Commander is responsible for aspects of the management of the fire, including:

- G Providing a size-up of the fire to dispatch as soon as possible.
- G Using guidance found in the fire Management Plan or in the Delegation of Authority, determine the strategy and tactics to be used.
- G Determine the resources needed for the fire.
- G Brief assigned resources on the strategy and tactics to be used, expected fire behavior, historic weather and fire behavior patterns, impacts of drought, live fuel moisture, escape routes and safety zones, and radio frequencies to be used.
- G Advising dispatch of resource needs on the fire.
- G Managing all aspects of the incident until relieved or the fire is suppressed.

Mutual aid resources responding from fire departments to Service fires will meet the standards set by their own department. Upon arriving at the scene, all resources, including mutual aid resources, will report to the IC (either in person or by radio) prior to deploying to the fire. Mutual aid forces will be first priority for release from the fire. Neighbors, cooperators, or the general public who show up on scene to assist will not be allowed to help with fire suppression activities unless they are part of a volunteer fire department. Procedures outlined in the dispatch section and elsewhere in this plan will be used to acquire additional Service and Interagency fire personnel and resources.

9.5.2 Appropriate Management Response

Table 5 is intended to provide an overview of the Appropriate Management Response concept and provide guidance to an IC, who will select the appropriate management response based on current and projected environmental conditions and fire behavior and available resources.

Table 5: Appropriate Management Response

SITUATION	STRATEGY	TACTIC
1. Wildland fire on Refuge lands which does not threaten life, natural or cultural resources or property values.	Restrict the fire within defined boundaries established either prior to the fire or during the fire.	1. Holding at natural and man-made barriers. 2. Burning out. 3. Observe and patrol.
1. Wildland fire on Service property with low values to be protected. 2. Wildfire burning on to Service lands. 3. Escaped prescribed fire entering another unit to be burned.	Take suppression action, as needed, which can reasonably be expected to check the spread of the fire under prevailing conditions.	1. Direct and indirect line construction. 2. Use of natural and man-made barriers. 3. Burning out 4. Patrol and mop-up of fire perimeter.
1. Wildland fire that threaten life, property or sensitive resources. 2. Wildland fire on Service property with high values to be protected. 3. Observed and/or forecasted extreme fire behavior.	Aggressively suppress the fire using direct or indirect attack methods, holding the fire to the fewest acres burned as possible.	1. Direct and indirect line construction 2. Engine and water use. 3. Aerial retardant 4. Burn out and back fire. 5. Mop-up all or part of the fire area.

9.5.3 Minimum Impact Suppression Tactics (MIST)

Minimum Impact Suppression Tactics (MIST) are those actions taken to suppress fires with the least long-term impact to resources. Methods include cold-trailing, wet lining, use of natural barriers, limited use of power saws, limited use of mechanical equipment and hand dug line, etc.

9.5.4 Limits to Suppression Activities

- G The use of earth moving equipment for suppression activities (dozers, graders, plows) on the Refuge will not be permitted without the approval of the Refuge Manager.
- G Retardant will not be used within 300 feet of a wetland or other water course.

9.6 Escaped Fires/Extended Attack

The IC or Prescribed Fire Burn Boss will notify the Complex FMO and Project Leader, whenever it appears a fire will escape initial attack efforts, escape Service lands, or when fire complexity will exceed the capabilities of command or operational forces. The CFMO will coordinate extended attack operations including:

- G Assisting the Project Leader complete the WFSA (Wildland Fire Situation Analysis) (Appendix H).
- G Assisting the Project Leader complete the Delegation of Authority (Appendix H), if needed.
- G Assignment or ordering of appropriate resources through the North Dakota Interagency Dispatch Center (701-768-2552).

9.7 ___Mop up Standards and Rehabilitation

The IC will be responsible for mop-up and rehabilitation actions on Refuge fires. The standards established in the Fire line Handbook will be followed. Refuge fires will be patrolled or monitored until declared out.

Rehabilitation of suppression actions will take place prior to firefighters being released from the fire. Items that will be done include:

- G All trash will be removed.
- G Fire lines will be refilled and water bars added if needed.
- G Disced fire lines should be compacted as soon as possible to preserve the living root stock of natives grasses.
- G Overturned sod resulting from plowing must be rolled back with a grader or by hand and compacted to preserve native grass root stock.
- G Hazardous trees and snags cut.
- G Stumps cut flush.

Other emergency stabilization and emergency rehabilitation measures may be taken in accordance with Chapter 5 of the Fire Management Handbook. Briefly:

- G **Emergency stabilization** is the use of appropriate emergency stabilization techniques in order to protect public safety and stabilize and prevent further degradation of cultural and natural resources in the perimeter of the burned area and downstream impact areas from

erosion and invasion of undesirable species. The Incident Commander may initiate Emergency Stabilization actions before the fire is demobilized, as delegated by the Agency Administrator, but completing emergency stabilization activities may be completed after the fire is declared out.

- G **Rehabilitation** is the use of appropriate rehabilitation techniques to improve natural resources as stipulated in approved refuge management plans and the repair or replacement of minor facilities damaged by the fire. Total "rehabilitation" of a burned area is not within the scope of the Emergency Rehabilitation funding. Emergency Rehabilitation funding can be used to begin the rehabilitation process if other funding is committed to continue the rehabilitation throughout the life of the project (beyond the initial 3 years of Emergency Rehabilitation funding). Major facilities are repaired or replaced through supplemental appropriations of other funding.
- G Because of the emergency nature of the fire event, the emergency stabilization section of the **Emergency Stabilization and Rehabilitation Plan** (ESR Plan) must be developed expeditiously and is frequently developed by a local unit or designated burned area ESR team. The rehabilitation section of the ESR Plan is not considered an emergency, and is developed as other refuge land use plans. The refuge manager is responsible for preparing all ESR Plans. In order to be funded, ESR Plans must meet resource management objectives and be approved by the Project Leader and the Regional Director.

10.0 PRESCRIBED FIRE PROGRAM

10.1 Program Overview

Management Ignited prescribed fire will be used to restore, create, and maintain a diversity of plant communities in order to restore and perpetuate native wildlife species. With the elimination of fire as a natural part of the prairie community, some grassland areas have degraded reducing the diversity of plant and animal communities. Exotic grasses, weeds, or brushy vegetation can reduce the desirability of the vegetation for nesting migratory birds and lower the forage value for native animal species. Prescribed fire will be used to improve these conditions.

This area of North Dakota is rural and sparsely populated. Outdoor recreation activities allowed on the Complex include hiking, photography, picnicking, bird watching, fishing and especially hunting. Most WPAs are open to public hunting as specified in the Code of Federal Regulations and in accordance with State law. Tewaukon National Wildlife Refuge Complex allows public hunting on portions of the refuge at times of the year when the use will not conflict with the primary purposes of the refuge. The Refuge and WPA's are also utilized by local cooperators for haying, grazing and cropping.

Recreational use and fire management can interact in several ways. Obviously the more recreational use the Complex receives, the greater the likelihood of human caused wildfire. Since the lands within the Complex fall under regulation by the State of North Dakota Rural Fire Suppression Plan, regulated by the North Dakota Fire Marshall's Office, some recreational activities may be eliminated or restricted when the fire danger rating is in the Very High to Extreme categories.

Prescribed fire programs may also be limited by recreational use patterns. These are management decisions based upon public safety. It would be difficult to check certain units to insure no hunters are inside the burn perimeter prior to burn execution, however, reconnaissance of burn areas in order to locate vehicles will virtually eliminate the potential conflicts due to current low public use levels. Other areas of the refuge must be carefully checked, roads and trails closed or other measures taken prior to a burn to insure recreational user safety is not compromised.

To minimize negative impacts of prescribed burning; adjacent residents, landowners and cooperators are notified of potential burn units and also notified on day of burn. Questions or concerns can be addressed prior to implementing the prescribed burn. A news release is sent out to local news papers every spring prior to burn season stating that the Refuge may be conducting prescribed burning operations and requesting that questions be directed to the Refuge Office.

Timing of burn units may be dependent on adjacent fuels. Spring burns may be utilized if adjacent crop land or fuel loadings make it unsafe to burn in the fall. Disked or mowed fire breaks may be used to provide protection for adjacent lands.

10.1.1 Resource management objectives

Goals of resource management burns include:

- G Restoration of native prairie grass species by treating 2,500 acres annually.
- G Reduction/control of non native grasses, especially Kentucky bluegrass and smooth brome
- G Control of woody species invasion of grasslands.
- G Aid in control of noxious weeds particularly leafy spurge and wormwood sage.
- G Control of dense cattail growth in shallow wetlands by treating 200 acres annually.
- G Stimulate sprouting of Burr oak along the shores of Tewaukon Lake.
- G Assist the Complex farming program by burning small grain stubble and burning for site preparation of grass seeding projects, and to stimulate seed source planting such as Canada vetch, green needle grass, and big blue stem (500 acres annually).
- G Maintain/rejuvenate quality nesting cover for waterfowl.
- G Reduce hazardous fuel loading that could be harmful to values at risk on the Complex or adjacent lands by treating 2,500 acres annually.

Achieving many of the above goals requires repeated prescribed burns over a 12-15 year period with a 3-5 year burn frequency.

Many of the prescribed burns conducted in the Complex are adjacent to water resources; some, such as cattail reduction burns, take place right over water or ice. Post fire erosion and wind born ash deposition impacting water resources is not a concern for the type and scale of burns

conducted on the Complex. Burn size is generally small (average 170 acres) and grass fuels do not produce heavy volumes of ash as compared to forest fuels. Supporting documentation regarding fire effects on water resources can be found in Effects of Fire on Water: A State of the Knowledge Review (1979).

Wetlands can present safety problems as they are numerous (30 per 160 acres) and working around them can result in getting stuck in heavy fuel concentrations. Access roads and trails are generally available.

10.1.2 Hazardous fuel reduction

Prescribed fire will also be used to reduce hazardous fuel loading on the Tewaukon Complex. Fuels in some sites have six inches or more of accumulated litter. The large volume of litter contributes to control problems during suppression actions. High litter loadings allow wildfires to carry even during full green-up conditions. To the greatest extent possible, hazardous fuel burns will only be used when they can complement resource management objectives. The reduction in fuel loading will help reduce the probability of escape from Complex lands and reduce risk to values at risk on and off the Complex such as the Western Prairie Fringed Orchid, Dakota Skipper, private dwellings and equipment.

10.1.3 Use of fire to Achieve Resource Objectives

The Complex has elected not to consider the effects fire may have on natural resources when determining the appropriate management response for the following reasons:

- G Rapid rates of spread in predominant grass fuels would create high probability of escape to private land.
- G Conflicting land uses within the Complex; haying and grazing.
- G Small size of FWS land units creates high probability of escape to private land.

10.1.4 Burning Season(s)

The normal prescribed burn season begins approximately April 1 depending on snowmelt. The season continues until late fall, approximately October 30. Most units are not burned between May 30 and August 1 during peak nesting season. When a particular unit is burned depends on burn objectives. Some burning will occur during the winter depending on snow conditions. Winter burns are generally for cattail control in wetlands and for burning blacklines to be used as control lines for future burn units.

10.1.5 Limits

- G The use of earth moving equipment for suppression activities (dozers, graders, plows) on the Refuge will not be permitted without the approval of the Refuge Manager.

- G Retardant will not be used within 300 feet of a wetland or other water course.
- G Prescribed fires will not be conducted with the KBDI exceeds 600 or the Palmer Drought Index is in "Extreme Drought" (Greater than a 4).
- G The Complex will not ignite a prescribed fire if the State of North Dakota or neighboring counties have issued a burn ban.
- G All management ignited prescribed fires will be conducted in accordance with pre-approved Prescribed Burn Plans. Burn plans will be in compliance with all federal and state laws and regulations.
- G All required notifications will be made and approval received before proceeding with the implementation of the burn plan.
- G Sufficient suppression forces will be identified and must be available for each burn in the event of an escape. The type and number will be defined in each burn plan.
- G All actions will be in accordance with Service Policy.

10.2 Complexity

Risk from wildfires or prescribed fires escaping refuge lands in the Red River Valley is low due to barriers created by intensive farming on private land. Access for fire suppression equipment is generally good due to flat topography and numerous section line roads and trails.

Most burns in the Tewaukon Complex fall within the low complexity category as determined by the Region's Complexity Analysis system (Appendix I). The average number of personnel required to conduct a burn on the Complex is 5-6. Most burns are structured with a burn boss, 4-5 prescribed fire crew members (RXCM), and two light engines.

10.3 Planning

Prescribed burns can be conducted at any time of year depending on resource objectives and prescription. The Project Leader and the District FMO are responsible for supervising the development of resource management objectives for individual units. The Refuge staff will provide assistance in selection of the appropriate management tool needed to meet objectives. Prescribed fire is just one of a combination of tools available. If needed, the Zone FMO, or Regional Prescribed Fire Specialist will be consulted for assistance in accomplishing the desired objectives.

Throughout the year the Refuge Biologist will be monitoring habitat and wildlife populations on Service lands. When it becomes apparent that fire would be an appropriate tool to employ in a certain situation, he will use the information to develop the annual plan. After reviewing the proposal, the Project Leader will decide whether to proceed with a planning effort. Guidance provided in the Service Prescribed Fire Management Handbook (621 FW) will be adhered to in all prescribed burning activities on the Refuge.

As indicated, an Annual Burning Plan will be prepared according to the Region 6 format and will contain more specific information on areas proposed for burning. Fire prescriptions will be

prepared for every planned habitat burn in accordance with established Service and Regional procedures.

At the earliest possible time, but no less than 60 days prior to the expected burn date, the prescribed fire plan for each burn should be completed and presented to the Project Leader. The burn plan will document objectives and the plan of action for achieving them. The plan must also address all training, personnel, equipment, and other requirements as specified in the Service Fire Management Handbook. Burn plans can be written by anyone but must be reviewed by a qualified burn boss prior to implementation. The plan is then sent to the Zone Fire Management Officer for review. When the plans are returned after the Zone FMO's review, the Project Leader will insure changes to the plan as necessary are made based upon the Zone FMO's comments, then approve the plan.

Through out the year, the Biologist and District Fire Management Officer will conduct informal reviews of the Refuge's fire management activities. As part of the process, all prescribed fires will be reviewed to insure that adequate support is available to conduct planned burns and that habitat management objectives were achieved. Written notes attached to the burn plan and the notes will be used to plan the next year's fire management activities.

Multiple prescribed fires may be initiated at the same time within the Refuge. A qualified Prescribed Fire Manager will coordinate multiple burns. Depending on the complexity of the burns, the Prescribed Fire Manager need not be on scene but must be readily available by phone. The maximum number of simultaneous burns will depend upon the cumulative impacts of smoke on sensitive targets and the availability of the prescribed equipment and personnel.

The Refuge may also assist private landowners with prescribed burning to improve the value of their land as wildlife habitat. A Wildlife Extension Agreement with a written provision for the use of prescribed fire must be approved prior to implementing burns on private lands. Such assistance is subject to guidance provided within the Fire Management Handbook, private lands program policies, Region 6 Fire Management Guidelines, and funding and staffing restraints.

The Complex managers, biologist, and fire staff will decide what units will need treatment with fire and what resource objectives need to be met. The time frame for this will be sometime between November and January. The fire staff will write the plans and submit them to the Zone FMO in time to be approved before the beginning of the prescribed fire season.

10.3.1 Contingency Planning

Every burn plan will address contingency planning. General contingency planning elements are listed in the following paragraph. More specific information regarding contingency planning may be included for a particular prescribed burn if the need exists.

A contingency section will be included in all prescribed burn plans and shall address the following essential elements:

- G Trigger points that are clearly defined.
- G Instructions for reporting an escaped fire or slop-over.
- G Who has the authority to activate the contingency plan.
- G The initial actions to be taken to suppress the wildland fire (Included in this section will be the organizational structure, strategies, tactics, additional resources, health and safety concerns).
- G Who is to be notified when the contingency actions are implemented.
- G The location of values or resources requiring protection and established priority for providing protection.
- G Containment opportunities outside of the burn unit . Escaped fire contingency lines are natural or human made barriers to fire spread; such as water, roads, fields and heavily grazed pastures, that may be used as indirect holding lines in the event of an escape. Any residences or other private property within these identified lines will receive priority protection.

Contingency forces are dependent upon onsite resources, local RFD's, FMO and staff, and North Dakota Dispatch Center. These resources will be contacted the morning of a burn to verify their availability.

Determining when to implement the contingency plan or declare a prescribed fire a wildfire will vary with every situation. Therefore, clearly defined trigger points that indicate when the contingency plan will be implemented and under what circumstances the prescribed fire will be declared a wildfire will be identified in each prescribed burn plan. The following are examples of trigger points that may be used:

- G When three or more slope-overs occur within a 30 minute period or when an escape exceeds the ability of the holding forces to suppress it in a timely manner.

- G When private property, cultural resources, structures and other resource values are threatened.
- G When the fire behavior predictions exceed the prescription parameters (MANDATORY).

Mutual Aid Agreements are in place with local RFD's for suppression and protection of wildland and structural fires. If wildfire can not be contained by on site resources or it is a structural fire, the contingency plan will be implemented. District FMO and NDC will also be notified of situation and additional resources needed.

10.4 Preparation and Implementation

The Fire staff will be responsible for preparing all fire equipment used for prescribed burning prior to the spring burning season. Prescribed burn units may require preparation including; mowed fire lines, black lines, tree or shrub removal, and public contacts. Preparation for burns will be handled on an individual basis and will be identified in the prescribed burn plan for that unit. The Complex Managers and fire staff will prioritize the units to be burned on a Complex-wide basis.

Staff who are to work on the burn should be notified on the burn schedule at least four weeks prior to the burn to ensure that they plan their work and leave accordingly.

The week prior to the burn, all engines, tools, supplies, and other items should be checked to insure that things are ready and in working order. On the day prior to the burn date, the Burn Boss should inspect tools and equipment to be used so that unexpected shortages do not show up on the day of the burn and delay or prevent the planned burn activities.

The public will also be notified in advance of any schedules management ignited prescribed fire or in a timely manner of any wildfire.

10.5 Monitoring and Evaluation

The Region 6 Monitoring Guidelines will be used during prescribed fire activities to monitor the various values (Appendix J). After each prescribed burn a permanent record will be made for filing which will include all pertinent information about the burn, including the objectives, post burn results, weather, fire behavior, etc.

11.0 FIRE MANAGEMENT UNITS

11.1 General

Fire management units are areas that have similar fuel and terrain characteristics, common fire management strategies, and require similar effort to control wildfire or implement a prescribed fire program. Because suppression strategies, management restrictions, fuels, fire environment,

and values at risk are similar throughout the Complex, all lands within the Complex will be managed as a single fire management unit. The guidance provided in this section will pertain to both wildfire and management ignited prescribed fire.

Information regarding the Complex's physical description, fire history, values at risk, and fire weather has been addressed in previous sections of this plan.

11.2 Fuels and Expected Fire Behavior

11.2.1 Habitat Types

The primary habitat types within the Unit are found in Table 6.

Table 6: Primary Habitat Types

Habitat Type	Acres
Wetlands	7,181
Grasslands	11,694
Croplands	1026
Woodlands	261
Improvements	169

11.2.2 Primary Fuel

Fuel and vegetation types and characteristics of the Complex and surrounding area are:

G Short Grass (NFFL Fuel Model 1)

The short grassland type comprises approximately 40 percent of the upland acres. Perennial grasses are the primary fuel. Decomposition rates of grass fuels are slow which leads to heavier than natural fuel loadings if fire is absent. This fuel model also fits some of the private lands adjacent to Complex lands, particularly grazed pastures and hayland. Fuel bed depths are up to 1.0 foot deep.

G Tall Grass (NFFL Fuel Model 3)

The tall grassland type comprises of approximately 60 percent of the upland acres. Tall grass and marshland grasses are approximately 3 feet tall, one third of the aerial portion of the plant is usually dead.

12.2.3 Representative Sites

- G **DNC sites** are planted cover consisting of a mixture of wheat grasses and alfalfa. Many of these sites are now dominated by brome and Kentucky bluegrass, but an alfalfa component remains. Some forbs or some of the tall grass species may be represented in these stands, but they are generally scattered and only a small percentage of the overall cover. The NFFL Fuel Model for these sites is generally Fuel Model 1 - Short Grass under 1 foot.
- G **Tall grassland sites** are usually located on well drained soils. Brush species including wood rose and western snowberry can be a component of these sites. Planted natives and native sod are usually dominated by various combinations of grasses and forbs including: big and little bluestem, switch grass, indian grass, green needle grass, fringed sage, narrow leaved blazing star, prairie wild rose, hairy golden aster, pasque flower, lead plant, silver leaf scurf pea and Missouri goldenrod. Smooth brome and Kentucky bluegrass, two exotics are often large components of these stands as well. The National Forest Fire Lab (NFFL) Fuel Model for these sites is generally Fuel Model 3 - Tall Grass over 2.5 feet.
- G **Low grassland sites** are on moderately drained soils. Dominant species include big bluestem, switch grass, Baltic rush, cordgrass, reed canary grass, Kentucky bluegrass, black-eyed Susan, and Maximilian's sunflower. Less common species of these sites are smooth aster, prairie dropseed, and wild licorice. The NFFL Fuel Model for these sites is generally Fuel Model 3.
- G **Meadow sites** are poorly drained and the water table is usually within the rooting depths of most plants. Water is usually present in the marsh sites, and in these depressions or potholes, soils are usually inundated for extended periods. Dominant species of meadows on the area are reed canary grass, narrow leaved sedge, fox tail barley, prairie cordgrass, smooth aster, wild mint, and smart weeds. The NFFL Fuel Model for these sites is generally Fuel Model 3.
- G **Marsh sites** are dominated by common cattail, hybrid cattail, hardstem bulrush, soft stem bulrush, spike rush, common smart weed, slough grass, and water plantain. Cattails are a significant management problem for maintaining productive wetlands in the Complex. Wetlands become dominated by dense stands of cattail and there is little open water available for waterfowl. Prescribed fire has been used with a small degree of success in opening up cattail choked wetlands. The NFFL Fuel Model for these sites is Fuel Model 3.
- G NFFL Fuel Model 3 also fits adjacent private land enrolled in the **Conservation Reserve Program (CRP)**.

11.2.4 Expected Fire Behavior

NFFL Fuel Model 1 (Short Grass) is largely represented as NFDRS Fuel Model L (perennials), with some classified as NFDRS Fuel Model A (annuals). Fire spread in this

fuel type is governed by fine, very porous, and continuous herbaceous fuels that have cured or are nearly cured. Fires are surface fires that move rapidly through the cured grass and associated material. Very little shrub or timber is present, generally less than one third of the area. Fuel loading consists of fine dead fuels only, but average 1.5-2 tons per acre.

Fire behavior is directly related to the fine fuel moisture and wind speeds. Spread rates with moderate to high wind speeds can reach 255 chains per hour, with flame lengths exceeding seven feet. Spot fires are generally not produced because fuels are consumed too quickly and thoroughly. Fire fronts tend to become irregular as topography, fuel loads, winds, and/or natural barriers speed up or slow movements. Resistance to control is low to moderate, depending on wind speeds.

- G **NFFL Fuel Model 3 (Tall Grass)** is the predominate fuel model on the Complex. This model displays high rates of spread under the influence of wind. Wind may drive fire into the upper heights of the grass and across standing water. Fuel loading consists of fine and coarse dead fuels, averaging 3 tons per acre. Spread rates with moderate to high wind speeds can reach 200 chains per hour, with flame lengths exceeding 20 feet. Short range spotting (up to 500 feet) is common. Resistance to control is very high to extreme.

11.2.5 Fuel Loading and Unusual Fire Behavior

Fuel loading found throughout the complex vary depending on location and the level of management the area receives.

In the majority of the land within Sargent and southwestern Richland County where Complex lands are located the risk of wildfires or management ignited prescribed fires escaping refuge lands is low to moderate. Intensive farming and grazing on adjacent upland lands create barriers to fire spread during most of the year in the form of tilled fields, roads, and trails. However, in the fall, especially during dry years, small grain fields and untilled stubble can create large areas of contiguous fuels which will readily burn.

Large tracts of grass established under the Conservation Reserve Program (CRP) in the last 10 years are adjacent to Complex tracts. CRP is a farm program which restores highly erodible farmland back to grassland cover and cannot be grazed, hayed, burned, or farmed. CRP areas have heavy fine fuel loadings and are a concern for fire suppression agencies. The addition of CRP to the landscape creates the potential for a fire to exceed several thousand acres depending on the location and condition.

Unusual fire behavior can occur during drought conditions that evolve during short or long term dry periods or seasons. According to the Rangeland Fire Index there are 4 categories which will describe potentials for unusual fire behavior to occur. The categories are as follows:

1. **Low and Moderate**
2. **High**
3. **Very High**

4. Extreme

At the **Very High or Extreme Level**, prescribed fire activity will be halted if there are state or national burn bans. This is usually the level at which extreme or unusual fire behavior can occur.

Also when KBDI (Keetch Bryam Drought Indices) levels reach a level between 600 to 800, unusual or extreme fire behavior can occur as well. The BI (Burning Index) levels can give accurate estimations of expected flame lengths of a point source ignition(fire). When the BI levels reach 75 (or 90th percentile) or greater, extreme or unusual fire behavior can or will occur. The Refuge step-up plan addresses these issues for Fire readiness for Refuge firefighting personnel.

Unusual Fire Behavior can also be referenced in **section 8.2.6 (Severity and Emergency Pre-Suppression)**

11.3 Fire Effects

Photo transects will be utilized on prescribed fire units to determine fire effects. Monitoring will be conducted on an annual basis by the Complex FMO or the Refuge Biologist. All documentation of fire effects will be recorded in the pre and post burn monitoring sections of the Prescribed Fire Plans for those units.

11.3.1 Vegetation

Vegetation will be referenced in appendix K of the Comprehensive Conservation Plan (pg 31-48, also pg 118-119)

11.3.2 Wildlife

Fire is a natural and historical part of the Complex's ecosystems. Native wildlife evolved with fire and developed means of adapting to and benefitting from fires. However, the sensitive nature of some of the species require that their habitats be protected from large wildfires and prescribed fire be applied according to site specific criteria especially where adjacent habitat is lacking. Prairie restoration and maintenance burns on native tracts with rare butterflies is controversial and communication with specialists should continue throughout planning and execution. Mosaic unit management, time of year, rotational schedules, and intensity of the burns should be considered. Fire is not recommended on small sites (Royer 1992). However Dakota skippers and other native prairie butterflies can recolonize from adjacent unburned suitable habitat, if timing has allowed host plants to recover (Moffat and McPhillips 1993).

11.3.4 Soil

Soil erosion resulting from suppression or prescribed fire actions has not been a problem

anywhere in the Complex. Tactics such as wet lining and black lining are common, so the soils is protected by the thick sod. Other than during periods of extreme drought like that experienced during 1988 when it was necessary to cut fire lines to mineral soil, soils are not expected to be affected by wildland fire management activities.

11.3.5 Threatened and Endangered Species

Threatened and endangered species are referenced in Appendix K- Comprehensive Conservation Plan(pg 65)

11.4 Unit Fire Objectives

- G Ensure the safety of Service staff and the visiting public.
- G Minimize the damage of fire and fire suppression efforts on refuge resources by using Minimum Impact Suppression Tactics.
- G Prevent fires from escaping refuge boundaries onto adjacent private lands.
- G Utilize prescribed fire when it will be useful in achieving refuge wildlife and habitat objectives. On average, treat 5,000 acres annually.
- G Respond to wildfires in a cost effective manner consistent with the values at risk.

11.5 Unit Strategies

All wildfire fires will be attacked aggressively. All fires on the Refuge have the potential to escape into adjacent private land and cause damage to crops, pasture or improvements. For that reason all fires must immediately sized up by the responding Refuge fire personnel and a decision made as to whether the responding initial attack team can meet suppression objectives. If there is any doubt, then assistance should immediately be requested from local fire departments or interagency resources.

11.6 Unit Tactics

- G Fires will be attacked using engines when possible. Roads, wetlands, and other barriers will be used where possible as primary control lines, anchor points, escape routes and safety zones.
- G Burnout operations will be conducted from roads or other barriers when it is safe and effective to do so.
- G Burnouts will also be used to strengthen primary control lines when it is safe and effective to do so.
- G Approved fire retardant chemicals may be deployed by either air or ground forces when their use will be effective in containment, control or facility protection.

11.7 Limits to Strategy and Tactics

- G The use of dozer or plow lines will not be permitted on Service lands except to protect life or improvements such as buildings or bridges, and only with the approval of the Project Manager or his acting.
- G Hand line construction which causes soil disturbance is to be avoided.
- G Retardant is not used within 300 feet of a stream or other water feature.
- G Prescribed burning in areas where threatened, endangered, and candidate species exist will be coordinated through the Section 7 consultation with FWS Ecological Services.

11.8 Special Concerns

- G The heavy build up of fuels on CRP lands is a concern for fire suppression agencies in this area.
- G Access is good for light and medium engines. Wetlands can present safety problems as they are numerous (averaging 30 per 160 acres) and working around them can result in getting stuck in heavy fuel concentrations.
- G Escaped prescribed fires pose a threat to adjacent life and property, but proper planning and prescriptions, qualified personnel, and contingency planning will mitigate this threat.
- G Temporary air quality impacts from smoke may occur, but are mitigated by the fuel type (light flashy fuels), small burn unit size, and consultation with state air quality personnel.

12.0 ADDITIONAL OPERATIONAL ELEMENTS

12.1 Public Safety

Firefighter and public safety will always take precedence over property and resource protection during any fire management activity. Firefighter safety was covered previously. This section will deal with public safety.

Fire fronts in grass fuel models move rapidly and are dangerous. However, most of the grass units on the Refuge are small; therefore, entrapment by public users is not considered to be a big threat. A larger threat is neighbors who initiate their own suppression actions without proper training, equipment, or communication. The Refuge staff will attempt to keep the fire scene clear of people except for Service firefighters and cooperating volunteer fire departments.

Smoke from a Refuge fire could impair visibility on roads and become a hazard. During wildfires, the IC is responsible for contacting local law enforcement personnel to manage traffic hazards from smoke. Smoke from prescribed fires is addressed in the prescribed burn plan and its management and mitigation are the responsibility of the burn boss. Actions to reduce the hazards associated with smoke include: use of road guards and pilot car, signing, altering ignition techniques and sequence, halting ignition, suppressing the fire, and use of local law enforcement as traffic control.

Wildfires which might escape Service lands and spread to inhabited private property are also a concern. The IC is responsible for contacting local law enforcement officers to warn and evacuate the public from potentially dangerous situations. Additionally, the Refuge will use prescribed fire and other management techniques to manage hazard fuels in high risk areas.

12.2 Public Information and Education

Informing the public is an important aspect of fire suppression, fire prevention, prescribed fire, and the Service mission. Information and education are critical to gaining public support for the Refuge's fire management programs. There are several different aspects to this task:

12.2.1 Wildfire Suppression

During wildfire suppression, the IC is in charge of dispersal of information to the press and or public. The IC may delegate this responsibility if needed.

12.2.2 Prescribed Fire

Informing the public is a vital component of the prescribed fire program. During and immediately after, the Burn Boss will be responsible for this aspect of the program. This aspect of the operation may be delegated, as appropriate.

The following will be used to promote the prescribed fire program to the public:

- G Talks in local schools.
- G Attendance at local volunteer fire department meetings.
- G Including a prescribed fire message in Refuge interpretive publications.
- G Personal contacts with bystanders during burns.
- G conducting a successful prescribed fire program.
- G Sharing monitoring results with visitors and Refuge neighbors.

12.3 Prescribed or Wildland Fire Follow-up Procedures

Following the suppression of a wildfire or the completion of a prescribed burn, the IC and Burn Boss will:

- G Complete a DI-1202 Fire Report.
- G Include a list of all expenses and/or items lost or expended on the incident and list personnel assignments on the DI-1202.
- G Complete a Crew Time Reports for all personnel assigned to the wildfire or prescribed fire.
- G Submit the documents to the District FMO within 3 days of the fire being declared out.

The District FMO will enter the information into the FMIS database within 10 days after the fire is declared out.

12.4 Fire Critique and Review

12.4.1 Fire Management Plan Review

The Fire Management Plan will be reviewed annually to ensure the fire program advances and evolves with the Service's and the Refuge's mission. The plan has been reviewed with the CCP (Appendix K) and the necessary corrections have been made.

12.4.2 Wildfire Review

Wildfires will be critiqued by the IC and the results documented in the DI-1202. The Regional Fire Management Coordinator and/or Zone FMO will conduct formal critiques in the event of:

- G Significant injury, accident, or fatality.
- G Significant property or resource damage.
- G Significant safety concerns are raised.
- G An extended attack is necessary.

12.4.3 Prescribed Burn Review

Prescribed fires will be critiqued by the burn boss and documented in the prescribed burn plan. The Regional Fire Management Coordinator and/or Zone FMO will conduct formal critiques in the event of:

- G Significant injury, accident, or fatality.

- G An escaped prescribed fire occurs.
- G Significant safety concerns are raised.
- G Smoke management problems occur.

13.0 AIR QUALITY AND SMOKE MANAGEMENT GUIDELINES

The management of smoke is incorporated into the planning of prescribed fires, and to the extent possible, in suppression of wildfires. Sensitive areas are identified and precautions are taken to safeguard visitors and local residents. Smoke dispersal is a consideration in determining whether or not a prescribed burn is within prescription. Generally the fine grass fuels and small burn size generate low volumes of smoke for short duration (4-5 hours).

The Refuge's fire management activities which result in the discharge of pollutants (smoke, carbon monoxide, particulate, and other pollutants from fires) are subject to and must comply with all applicable Federal, State, and local air pollution control requirements as specified by Section 118 of the Clean Air Act, as amended 1990.

Smoke from wildfires and prescribed fires is a recognized health concern for firefighters. Prescribed burn bosses and wildfire incident commanders must plan to minimize exposure to heavy smoke to 1 hour or less, at which time the employee should be rotated to a smoke free area (USDA Forest Service, Missoula Technology and Development Center). The use of respirators is not recommended.

14.0 CULTURAL RESOURCES

Fire Management activities at the Refuge will be implemented in accordance with the regulations and directions governing the protection of cultural resources as outline in Departmental Manual Part 519, Code of Federal Regulations (36 CFR 800), the Archeological Resources Protection Act of 1979, as amended, and the Archeological and Historic Preservation Act of 1974. All fire management activities will be in compliance with Section 106 of the National Historic Preservation Act of 1966, as amended.

Cultural and Historical resources are referenced on Page 79 of the Comprehensive Conservation Plan (Appendix K).

Currently wildfires are suppressed. However, historical evidence demonstrates that natural and artificial fires were regular events in the mixed grass prairie. In recent years, fire suppression has resulted in a steady buildup of grassland and riparian fuel loads, colonization of disturbed soils by invading plant species, and natural vegetative growth, increasing the chances of an uncontrolled wildfire that could potentially endanger the Refuge's cultural resources as well as surrounding private property. Although over 20 years of fire ecology research allows ecologists

to predict impacts on biotic communities, the possible impacts of prescribed burning (and wildfires) on archeological resources are not well known. Research conducted in North Dakota indicated that fire-related impacts to buried artifacts are negligible, but effects on surface-exposed artifacts will be significant, depending on artifact type and size (Seabloom et al 1991).

Impacts to archeological resources by fire resources vary. The four basic sources of damage are (1) fire intensity, (2) duration of heat, (3) heat penetration into soil, and (4) suppression actions. Of the four, the most significant threat is from equipment during line construction for prescribed fires or wildfire holding actions (Anderson 1983).

The following actions will be taken to protect archeological and cultural resources:

- G Files and records of cultural resources should be consulted by the staff when planning prescribed burns, developing pre-attack plans, and performing other preparedness actions. The potential for adverse impacts to cultural resources will be evaluated prior to prescribed burning and in the selection of fire suppression strategies during wildfires.
- G The Regional Archeologist will be contacted during the development phase of the burn plan writing process when cultural resources are suspected or known to exist in the project area.
- G The North Dakota State Historic Preservation Officer (SHPO) will be contacted by the Regional Archeologist when it is known a planned management action may impact archeological or cultural resources. The SHPO has 30-days to respond. The Refuge will follow any programmatic archeological/cultural resources management plan that may be implemented in the future.
- G Low impact wildfire suppression tactics (cold-trailing, use of foam/wet-water/water, use of natural and manmade barriers, change in vegetation, mowing, etc.) will be used to the fullest extent possible. Line construction for prescribed fire activities will follow the same principle. Maps indicating the known location of significant cultural resources will be consulted prior to laying out burn units, and whenever possible, before constructing fireline to halt the spread of a wildfire.
- G Prescriptions for management ignited prescribed fires will take into account the presence of known cultural sites. Cooler fires with short residence time will be used in areas containing known cultural sites, whenever possible.
- G Known surface sites will be marked, protected, and excluded from the burn, if possible. Foam will not be used in areas known to harbor surface artifacts.
- G The use of mechanize equipment within the refuge must be approved by the Refuge Manager on a fire by fire basis, and the use these resources will be considered in the approval process for any planned management actions. When the use of heavy equipment is authorized, its use will be monitored.

- G The location of sites discovered as the result of fire management activities will be reported by the Refuge Manager to the Regional Archeologist.
- G Rehabilitation plans will address cultural resources and will be reviewed by the Regional Archeologist.

15.0 RESEARCH NEEDS

Fire behavior data will be collected on all fires occurring at the Refuge. Long-term monitoring will comply with accepted scientific methods and will be funded from sources other than Fire. These data, along with information gathered through research studies, will be used to improve the effectiveness of the fire management program. The Refuge will continue to encourage fire related research on Service lands where research operations will not conflict with resource management objectives.

16.0 CONSULTATION AND COORDINATION

All fire management program activities will be implemented in cooperation and coordination with the State of North Dakota Department of Health and Environment, and rural fire protection districts. Other agencies and organizations will be consulted as needed.

General program consultation and coordination will be sought from the Zone FMO, the Regional Fire Management Coordinator, Regional Prescribed Fire Specialist, and National Interagency Fire Center (NIFC).

Copies of this Fire Management Plan will be sent to the following parties for comment:

All fire management program activities will be implemented in cooperation and coordination with the State of North Dakota, North Dakota Department of Environmental Health, and rural fire protection districts. Other agencies and organizations will be consulted with as needed.

17.0 LITERATURE CITED

ANDERSON, H.E. 1982. Aids to Determining Fuel Models for Estimating Fire Behavior. USDA Forest Service. 22 p. Ogden, Utah

Barbour, M.G, J.H. Burk and W.D. Pitts. 1987. Interrestial Pland Ecology. Second Ed. Bebhannub-Cummings Publishing Company, Inc. Menco Park, California. 634 pp.

Best, L.B. 1979. Effects of Fire on a Field Sparrow Population. The American Midland Naturalist 101:434-442.

Dix and Smeirs. 1967.

Eldridge, J. 1992. Management of Habitat for Breeding and Migrating shorebirds in the Midwest. Fish and Wildlife leaflet 13.2.14. USDI, Fish and Wildlife Service. Washington, DC.

Higgins, K.F. 1986.

Higgins, K.F. 1984.

Higgins, K.F., A.D. Kruse, and J.L. Phiehl. 1989. Effects of Fire in the Northern Great Plains. United States Fish and Wildlife Service and Cooperative Extension Service, South Dakota State University, United States Department of Agriculture. Publication EC 761. 47 pp.

Hull and Sieg. 1994.

Hultburg,

Kirsh, and Kruse. 1972.

Lewis, Rhoda. Regional Archeologist. Region 6, United States Fish and Wildlife Service. Denver, Colorado.

Maher, W.J. 1973. Birds I: Population Dynamics. Canada Committee for the IBP, Saskatoon, Saskatchewan. 56 pp.

Moffat, J. and N. McPhillips. 1993. Management for Butterflies in the Northern Great Plains. A Literature Review and Quid Book for Land Managers. United States Fish and Wildlife Service Ecological Services Office. Pierre, South Dakota. 19 pp.

ROTHERMEL, R 1983. General Technical Report INT 143 - How to Predict the Spread and Intensity of Forest and Range Fires. USDA Forest Service. Intermountain Forest and Range Experiment Station. Ogden, Utah.

Royer, R.A. 1992. Conservation Status of the Powesheik Skipper in North and South Dakota. Minot State University.

SEABLOOM, R.W., et al 1991. Effects of Prairie Fire on Archeological Artifacts. Park Science Volume 11-Number 1. 3pp.

SHARKEY, BRIAN ed. 1997. Health hazards of smoke: recommendations of the April 1997 Consensus Conference. Tech. Rep 9751-2836-MTDC. USDA Forest Service. Missoula Technology and Development Center. Missoula, Montana. p 4-5.

USDA - Forest Service. 1997. Health Hazards of Smoke, Recommendations of the Consensus Conference April 1997. Missoula Technological and Development Center. Missoula, Montana. 84 pp.

U.S Fish and Wildlife Service. 2000, Comprehensive Conservation Plan for the Tewaikon NWR, Cayuga, North Dakota, 2002 pp.

U.S Fish and Wildlife Service. 1994. Final Environmental Assessment of Alternatives for Managing Upland Habitats on Tewaikon National Wildlife Refuge Complex. 77pp.

U.S Fish and Wildlife Service. 1994. Fire Management Plan for Arrowwood National Wildlife Refuge Complex. 39 pp.

U.S Fish and Wildlife Service. 1997. Maoutain-Prairie Region Wildland Fire Mobilization Plan. (Unpaged).

U.S Fish and Wildlife Service. 1968. Tewaikon Refuge Narrative, 1968.

Wright. 1978.

Wright, H.A. and W. Bailey. 1992. W. 1992. Fire Ecology. John Wiley and Sons. New York City, New York. 501 pp.

_____. 1999. Fireline Handbook - NWCG Handbook, National Wildfire Coordinating Group. Washington, D.C.

APPENDIX A: TEWAUKON COMPLEX WILDLAND FIRE HISTORY 1964-1997

Year	Name/Location	Acres	Cause
1964	Sprague Lake, TWK Refuge	0.25	Human
1965	Headquarters, TWK Refuge	0.25	Human debris burn
1965	Sprague Lake, TWK Refuge	1.00	Unknown
1966	White Lake, TWK Refuge	2.00	Human debris burn
1968	Sprague Lake, TWK Refuge	2.00	Escape Rx burn
1969	Office, TWK Refuge	28.00	Escape Rx burn
1970	Skroch's Bay, TWK Refuge	5.0	Human, field burn
1972	Smith WPA	12.00	Human, Hunter
1973	Kuehn WPS	148.00	Human debris burn
1973	Kaspari WPA	38.00	unknown
1976	Quarters #1, TWK Refuge	1.00	unknown
1976	North Refuge, TWK Refuge	1.00	unknown
1978	Boeder WPA	20.00	Human, RR Crews
1979	Krause WPA	1.50	lightning
1980	Lawrence Lee, TWK Refuge	200.00	unknown
1981	Klefstad WPA	5.00	human, equipment
1981	Gaukler WPA	2.00	human, field burn
1981	Gainor WPA	35.00	human, equipment

1984	Weaver WPA	2.00	Human, RR Crews
1987	Tewaukon NWR	1.50	human, trash burn
1988	TWK Refuge	unk	lightning
1988	TWK Refuge	unk	lightning
1988	TWK Refuge	unk	lightning
1991	Sprague Lake, TWK Refuge	5.00	Human, RR Crews
1992	Shelver WPA	30.00	unknown
1992	Horseshoe, TWK Refuge	0.10	human, field burn
1993	Kuehn 1 WPA	14.00	human, arson
1993	Kuehn 2 WPA	2.00	human, arson
1993	Krause WPA	35.00	human, field burn
1996	Krause Fence, TWK Refuge	35.00	human, equipment
1997	Labelle Creek, TWK Refuge	90.00	human, field burn

APPENDIX B: STAFF FIRE QUALIFICATIONS

District Fire Management Officer - David B. Martin- ICT3(t), RXB2, TFLD, STEN, STCR, HECM

Project Leader- Doug Staller - CRWB, RXI2

Deputy Project Leader- Jack Lalor- FFT1, RXI2

Office assistant- Angie Burwell- FFT2

5 seasonal Range Technicians(fire)- FFT2 to ENGB

Refuge Maintenance Personnel- Bill Huckle- FFT1

Rob Heflin - RXB2, FFT1

Lavonne Manikowski- FFT2

Tallgrass Prairie Coordinator- Craig Mowry- ENGB, RXI1, ICT5,HECM

Refuge Contact List:	<u>Work Phone</u>	<u>Home Phone</u>
David Martin	701-724-3598	701-427-5378
Doug Staller	“	701-724-4055
Jack Lalor	“	701-538-4427

APPENDIX C: COOPERATIVE AGREEMENTS

(placeholder for upcoming agreements)

APPENDIX D: NORMAL UNIT STRENGTH

Equipment

Item	Year Purchased	percent of Fire Funding	Have	GVW	Need	GVW
Engine Modules						
Heavy (500-1000 gallon)	2001,1999	100	2	28k		
Medium (200-400 gallon)						
Light (50 - 150 gallon)	1995	100	1	11k	1	11k
Slip-on Unit(s)	Surplus	100	1			
Water Tender(s)	66 Surplus	100	1	45k		
Portable Pump(s)						
Standard	1996	100	2			
Flot-a-pump	1991	100	1			
Power saw(s)	2000	100	1			
Mower(s)	1996	100	1		1	
Tractor(s)						

ATV(s)	1993,1996	100	2		1	
Grader(s)						
Plow Unit/Disk						
Other (List) Polaris 6x6	1999,2001	100	2		0	
Other Equipment Available for Fire Suppression or Prescribed Fire operations Not Fire Funded		Use the table to the left to list capital equipment used for preparedness and initial attack or for prescribed fire activities funded wholly or in part by fire.				
2 Farm Tractors		In the above table, Indicate the year purchased, if known, and the percent of fire funding (e.g.: The station purchased a tractor. Fire paid 25% and the station secured other funding for the remainder.				
ATVs						
Pickups						
Payloader						
		Radios are listed on a separate inventory				

Equipment

Item	Quantity	
	Need	Have
Hose, lightweight, lined 1.5" x 100'	9	
Hose, lightweight, lined 1" x 100'	9	
1" NH gated wye	2	
1.5" NH gated wye	2	
1.5" nozzle	2	
1" Forester nozzle	4	
Hydrant wrench, spanner	2	
Hose clamp	2	

flapper	6	7
Pulaski w/sheath	3	
Shovel w/sheath	6	7
rake	2	4
Combi tool	6	0
Drip Torch	2	4
Fusees	1 Case	
Safety Can: 3 Gallon	2	
Foam	15 gallons	
Backpack Pump	6	3
Canteen, large	2	
Belt Weather Kit	2	
Hard Hat	12	
Goggles	12	
Headlamps	12	
Fire Shelter w/Liner	12	
Line Pack w/harness	12	
Water Bottle	48	
Ear Plugs	12 pks	
Leather Gloves, Assorted sizes	24 pr	
Sleeping Bags	10	
Pearsonal Gear Pak (Red Bag)	12	
Personal First Aid Kit	12	
Nomex Shirts Small Medium Large X-Large	Enter Desired Number should have 18 pr (Men & Women)	

Nomex Pants - Men's 28x30 32x30 32x34 34x30 34x32 34x34 36x30 36x32 36x34 38x34 40x34		
Nomex Pants - Women's Size 10 Size 12 Size 14 Size 16		

APPENDIX E: FITNESS

Job-Related Work Capacity-Tests for Wildland Firefighters

Background Studies of wildland firefighting clearly show the link between fitness and work performance. Fit workers can do more work with less fatigue, and still have a reserve to meet unforeseen emergencies. They perform better in a hot environment, and recover faster from adverse firefighting conditions like long shifts and reduced rest. In short, fitness is the most important factor in work capacity.

Since 1975 Federal Agencies have used a 5-minute step test and an alternative 1.5 mile run test to screen candidates for wildland firefighting. In 1994 the Missoula Technology & Development Center (MTDC) began a review of work capacity testing alternatives. MTDC conducted a comprehensive job task analysis and extensive laboratory and field studies of candidate tests. The result is a family of job-related field tests.

Work Category	Test	Distance	Pack	Time
Arduous	Pack Test	3 Miles	45 lbs	45 min
Moderate	Field Test	2 Miles	35 lbs	30 min
Light	Walk Test	1 Mile	none	16 min

Pack Test The test consists of a 3 mile hike with a 45 pound pack (fire-suppression water bag) over level terrain. A time of 45 minutes, the passing score for the test, approximates a step test score of 45 (ml/kg.min), the established standard for wildland firefighters. The test is a valid, job-related test of the capacity for arduous work, defined as: "Duties involve field work requiring physical performance calling for above average endurance and superior conditioning. These duties may include an occasional demand for extraordinarily strenuous activities in emergencies under adverse environmental conditions and over extended periods of time. Requirements include running, walking, climbing, jumping, twisting, bending, and lifting more than 50 pounds; the pace of work typically is set by the emergency condition." The energy cost of the test is similar to that demanded on the job. The Pack Test is correlated to measures of aerobic and muscular fitness, as well as performance in field tasks such as working with hand tools, or carrying loads over rough terrain. The duration of the test insures the capacity to perform prolonged arduous work under adverse conditions, with a reserve to meet emergencies.

Field Test A 2 mile hike with a 25 pound pack in 30 minutes, approximates a step test (max V02) score of 40. A job-related test of work capacity designed for those with moderately strenuous duties: "Duties involve field work requiring complete control of all physical faculties and may include considerable walking over irregular ground, standing for long periods of time, lifting 25 to 50 pounds, climbing, bending, stooping, squatting, twisting, and reaching. Occasional demands may be required for moderately strenuous activities in emergencies over long periods of time. Individuals usually set their own work pace.

Walk Test This one mile walk test approximates a step test score of 35 is a test to determine the ability to carry out light duties: "Duties mainly involve office type work with occasional field activity characterized by light physical exertion requiring basic good health- Activities may include climbing stairs, standing, operating a vehicle, and long hours of work, as well as some bending, stooping, or light lifting. Individuals almost always can govern the extent and pace of their physical activity."

Instructions

The Pack Test is a 3 mile hike with a 45 lb pack over level terrain. Field studies show . that performance on the pack test is significantly related to performance of firefighting tasks, including line construction with hand tools. Studies conducted at the University of Montana Human Performance Laboratory indicate that the energy cost of the test is similar to the cost of firefighting tasks. A score of 45 minutes on the Pack test approximates a Step Test Score of 45 (ml/kg-min). Because of its length, the Pack Test is an excellent indicator of sustained work capacity. Scores on a flat course are highly related to performance on a hilly course. And performance on the Pack Test is significantly related to vascular fitness, including measures of upper and lower body strength. The Pack Test is: job-related, safe, inexpensive, and easy to administer. It is a valid, reliable, and objective measure of work capacity that does not adversely impact workers on the basis of gender, ethnicity, age, height, or weight. (These instructions apply to the Field and Walk Tests).

The course

Course must be essentially level and have a firm, relatively smooth walking surface. Course length (3 miles) must be accurate: double-check measurements. Use a measuring wheel or a calibrated bicycle computer. Vehicle odometers are not sufficiently accurate.

Loop or out-and-back courses are preferable. Avoid one-way courses where unfavorable conditions (wind, grade) are not offset. A moderate grade (2-3%) is acceptable if the course starts and finishes at the same place. Have lap counters available for multi-loop courses. Use course monitors when needed.

Candidates must be informed of the course layout (use a map or sketch of the course). Use distance markers (e.g., at 1 or 1.5 miles) to aid candidates. Use hazard and traffic makers as needed.

Equipment

Packs: The 5 gallon backpack pump water bag (NSN8465-01-321-1678, cost \$35.23) used in test development is recommended: The number required will depend on the number of candidates to be tested simultaneously. If other packs are used the test administrator must insure the correct weight (45 lbs).

Pack liners: (NSN8465-01-321-1679, cost \$6.51): Have at least one extra liner for each pack.

Canteens:(NSN8465-00-102-6381, cost \$0.43): Use up to 2 in pack pocket to obtain proper weight (45 +/- 2 lbs).

Safety Vests/Route Markers: As needed.

Distance Markers: Use mile and mid-point markers so candidates can maintain proper pace.

Stop watches: Utilize 2 watches to provide back-up timing.

Vehicle: Bicycle or other vehicle to monitor candidates on the course.

Radios: As needed for monitoring and safety.

Scale: An accurate hanging style spring scale is recommended for weighing packs.

Forms: PAR-Q health screening questionnaire and an informed consent form (attached). Data collection form (should include: site, date, conditions, test administrator, and columns for name, gender, age, height, weight, Pack Test and other scores - step test, 1.5 mile run, etc.).

Test Administration

One person can administer the test when:

- The administrator is a trained First Responder (American Red Cross) or equivalent.

- The timer can monitor the course.

- The safety/med evacuation plan can be executed.

- Five or fewer people are being tested at one time.

- Candidate safety and compliance with test requirements can be assured.

For larger groups or when course monitoring is difficult, a 2 to 3 person team should be used.

Testing Tips

Fill packs the night before to check for leaks (use plumber's Teflon tape to stop leaks in threaded fitting).

Weigh bags before test. Check weight after the test if necessary. Note: Bags are used without trombone pumps.

Group or staggered starts can be used. Many candidates will benefit from the support provided by a group start.

Environment: Administer the test in moderate environmental conditions; do not test new recruits when the temperature is high or when the temperature and humidity combine to create high heat stress conditions (see heat stress chart); if necessary, test early in the day to avoid high temperature/humidity combinations; avoid high winds that may affect performance.

Hydration: If the weather is hot, encourage candidates to drink fluids prior to the test, and provide fluid replacement mid way in the course. Candidates may carry a water bottle.

Altitude: Use this chart to adjust for test administered at elevations above 4,000 ft.

Table I: Altitude Corrections for Work Capacity Tests*

Altitude	Pack Test	Field Test	Walk Test
8-9,000 ft	90 sec	60 sec	30 sec

7-8,000 ft	75	50	25
6-7,000	60	40	20
5-6,000	45	30	15
4-5,000	30	10	10

* Add correction to required test time (e.g., Pack Test at 6-7,000 ft, add 60 seconds to test standard (45 min) for altitude adjusted standard of 46 n-dn.

The altitude adjustment assumes that the candidate has had an opportunity to acclimate to the altitude of the test site. If a candidate does not meet the required standard, even with the adjustment, he or she should be encouraged to train at the altitude and retake the test.

Instructions for Candidates

In advance of test: Distribute confidential PAR Q physical activity readiness questionnaire so candidates can decide if they should seek medical advice before taking the test. Have candidates read and sign an informed consent form.

Clothing: Candidates may select the clothing worn during the test. "T" Shirts and shorts are acceptable. Footwear that provides ankle height support, such as hiking boots or ankle height sport shoes, is required for the Pack and Field tests, and recommended for the walk test.

Safety: Brief candidates on the test, the course, safety considerations, and accommodations. Tell candidates to terminate the test if they experience major physical problems or discomfort, or feel the need to terminate for any reason.

Pace: Demonstrate to candidates how they should hike (power walk) the course as fast as possible without jogging. The heel of one foot must make contact before the opposite toe leaves the ground. jogging or running will invalidate the test and require a retest.

Accommodations: Candidates may use gloves or other padding to make the pack more comfortable. A candidate-provided walking staff may be used during the test.

Hydration: If weather is hot, tell candidates to drink plenty of fluids prior to the test. Candidates may elect to carry a water bottle, but the extra weight will not be counted as part of the pack weight.

Essentials of Good Testing

*An accurately measured flat course with good surface.

* Proper weight packs. Use the specified water bags and verify pack weight with a calibrated scale. If alternative packs are used encourage candidates to adjust them properly.

* Duplicate and accurate timing. Give candidates split times along the course (e.g., at one mile or the mid point - 1.5 mile for Pack Test).

* Candidates should be rested and well informed about the course and the need to maintain a fast pace.

* Favorable environmental conditions. Avoid adverse conditions.

* Complete the PAR Q physical activity readiness questionnaire and sign an informed consent form.

Safety

A locally developed safety/med evacuation plan must be prepared for the course.

Test administrator(s) must be familiar with the safety plan.

A trained and qualified American Red Cross First Responder (or equivalent) who knows the symptoms of physical distress and appropriate first aid procedures must be on site during the test.

Avoid use of roads and intersections ' where traffic is a problem ' or concern. When using roads, use traffic control devices and traffic controllers in hi-visibility vests as needed.

Require candidates to read and sign the PAR Q health screening questionnaire and an informed consent form..

Check to see that candidates are wearing proper (above ankle) footwear.

Encourage candidates to stretch and warm up prior the test.

Do not test tired or injured individuals, or test during conditions that could compromise health or safety.

Monitor candidates to identify those having difficulties and encourage them to terminate the test if necessary.

Encourage fluid intake and replacement and provide fluids in route when . heat stress conditions (temperature /humidity) exist.

At the mid-point, terminate those who are substantially behind the required pace (22.5 minutes for 1.5 miles and/or are having difficulty maintaining the pace. Candidates cannot jog or run to make up time.

Encourage a cool down with an easy walk after the test. Monitor the recovery of candidates who appear exhausted or distressed.

Recommend several weeks of training before retaking the test.

Training for the Pack Test

Begin at least 4 to 6 weeks before you report for duty. Train by hiking or power walking, using the ankle height footwear you will use in the test.

- \$ Hike a 3 mile flat course without a pack. When you can cover the course in less than 45 minutes;
- \$ Add a pack with about 25 pounds to your training hikes;
- \$ Increase the pack weight until you can hike 3 miles in 45 minutes with a 45 pound pack. Also:
 - \$ hike hills (w pack) to build leg strength and endurance
 - \$ jog the flat course (w/o pack) to build aerobic fitness
 - \$ hike/jog over distance for stamina
 - \$ engage in cross-training (mountain biking, weight lifting).

Finally, do job-specific tasks and training to become work hardened for the coming season. Wear work boots on extended hikes. Work with hand tools to prepare trunk and upper body muscles for prolonged work. Work hardening insures that the hands, feet, muscles, tendons and ligaments used on the job are tough and ready to go.

Informed Consent

Work Capacity Tests

2/97

Pack Test intended for those involved in arduous duties (defined as requiring a max V02 of 45, lifting more than 50 pounds and occasional demand for extraordinarily strenuous activities). The 3 mile test with a 45 pound pack in 45 minutes is strenuous, but no more so than the duties of wildland firefighting.

Field Test intended for those with moderately strenuous duties (requires a max V02 of 40, lifting 25 to 50 pounds, and occasional demand for moderately strenuous activity). The 2 mile test with a 25 pound pack in 30 minutes is fairly strenuous, but no more so than field duties.

Walk Test intended for those whose duties involves light work with occasional field activity (required max V02 of 35). The -1 mile walk in 16 minutes is moderately strenuous, but no more so than the duties assigned.

Risks: There is a slight risk of injury (blisters, sore legs, sprained ankle) for those who have not practiced the test. If you have been inactive and have not practiced or trained for the test, you should engage in several weeks of specific *training before* you take the test. Be certain to warm up and stretch before taking the test, and to cool down after the test. The risk of more serious consequences (e.g., respiratory or heart problems) is diminished by completing the PAR Q physical activity readiness questionnaire.

If you cannot answer NO to all the questions in the PAR Q health screening questionnaire, or if you are over 40 years of age and unaccustomed to vigorous exercise, you should contact your physician, by phone or in person, before you take the test. Your physician may want to see PAR Q and information about the test or job demands.

1. I have read the information on this form and understand the purpose, instructions, and risks of the job-related work capacity test.

2. I have read, understood, and truthfully answered the PAR Q physical activity readiness questionnaire.

3. I believe I have the ability to complete the test and carry out the assigned duties of the position (e.g., wildland firefighter).

4. I assume responsibility and release the US Government from liability for injuries sustained in testing that result from any physical or mental disorders.* * Reference EEOC #915.002,5/19/94

Test (circle) Pack Field Walk

Signature _____ Date _____

Print Name _____ Witness _____

QUESTIONS AND ANSWERS "PACK TEST"

1. **why are we** changing from the Step Test and 1 1/2 mile run?

ANSWER: The Step Test has been used since **1975 by Federal land management** agencies. New Laws (Americans With Disabilities Act), field experience and research on long-term work capacity caused us to reevaluate the current tests. In 1990 the Service-Wide Civil Rights Action Group requested the Forest Service Fire and Aviation Management staff to evaluate the Step Test. They believed that it discriminated against people who should be able to participate in fire activities. The Missoula Technology and Development Center (NMC) was assigned the work of assessing the technical and legal aspects of the Step Test and 1 1/2 mile run. The appropriateness of the physical fitness standard for fire suppression positions was evaluated by the National Wildfire Coordination Group (NWCG). The conclusions were:

The Step Test and 1 1/2 mile run do not meet Federal requirements of testing employee fitness (Federal Uniform Standards for Employee Selection Procedures).

The Step Test and 1 1/2 mile run are not performance related and are therefore not appropriate tests.

Many of the fire position physical fitness standards were not required in order for incumbents to perform the duties of the positions. The fitness requirement were eliminated for many positions and were revised for others in the 1993 revision of the Wildland Fire Qualification Subsystem used by NWCG. (See Summary of ICS Physical Fitness Requirements attached to this document.)

The post-exercise heart rate count used in the step test is difficult to perform accurately thus giving incorrect fitness assessments for some employees.

2. What is the objective of fitness testing/ the "Pack Test"?

ANSWER: Fitness testing was introduced to the process of selecting wildland fire personnel to help reduce the number of heart attacks and

other physical fitness related illnesses and injuries experienced by firefighters. Specifically, fitness testing is to determine if a person has the minimum levels of aerobic and muscular fitness to perform the tasks associated with their assigned fire suppression positions safely and effectively.

3. Did line management participate in the decision to utilize the "Pack Test"?

ANSWER: The direction for Fire and Aviation Management to review the Step Test in response to the Service-wide Civil Rights Group came from Dale Robertson, Chief of the Forest Service at that time. The action plan for the review was accepted by the Chief. A 5100 memorandum dated May 29, 1996 signed by John Chambers acting for the Director of Fire and Aviation Management went to all Regional Foresters and Area Director requesting review and comments. The letter explained that the "Pack Test" was proposed to replace the existing tests and giving the history and rationale leading to the "Pack Test".

4. Why was the "Pack Test" chosen?

ANSWER: The enclosed materials contain the details but the general reasons are:

The existing tests were not appropriate in terms of what they were established to evaluate or with respect to legal requirements and the "Pack Test" was developed to meet those criteria.

The "Pack Test" development followed the Federal Uniform Guidelines for Employee Selection producers beginning with a Job Task Analysis for Wildland Firefighting.

The "Pack Test has "energy costs" similar to tasks performed on the fireline. It is significantly correlated to laboratory measures of aerobic and muscular fitness and to performance on field tasks.

Statistical analyses of the data from field tests run on 333 firefighters show no "adverse impact" for gender, ethnicity, age, height or weight based on the Equal Employment Opportunity Commission (EEOC) standard.

5. Are all state and contractor personnel required to take the "Pack-Test"?

ANSWER: The Forest Service requires all contractors' personnel to meet the fitness standard used by the Forest Service. After January 1, 1998, contractors personnel employed by the Forest Service will have to pass the "Pack Test" if required by the position filled. All agencies have the flexibility to establish the appropriate physical fitness test(s) for their personnel under the ICS 310-1, Wildland Fire Qualification Subsystem Guide.

By agreement, all NWCG members (includes the states) accept each others' personnel based on the certification used by the respective members.

6. Was there a control group for the "Pack Test"? What was its makeup? What statistical information is available?

ANSWER: Yes, the attached information prepared by Dr. Sharkey describes the design of the project and details the steps involved.

7. Is the "Pack Test" gender neutral?

ANSWER: Yes, Dr. Sharkey's information describes the testing, the analyses of the data obtained and the conclusions relative to "adverse impact" defined by EEOC.

8. Is the "Pack Test" equally effective in testing the fitness of a 200-pound firefighter and a 120-pound firefighter (45 pound pack requirement for Arduous)?

ANSWER: Yes, Dr. Sharkey's information shows no "adverse impact" based on firefighter weight.

9. Were fire medical records reviewed to ensure that the "Pack Test" is the correct test to prevent injuries/illnesses resulting from inadequate fitness levels?

ANSWER: The goal of work task related testing is to subject employees to testing that represents tasks they would routinely perform on the job. The task analysis identified those kinds of tasks. The development of the two alternative tests that were analyzed was based on the tasks identified. The "Pack Test" is not and was not intended to replace an intensive physical examination which could evaluate the myriad of physical and medical parameters and conditions to "ensure" accident/illness prevention. It is a screening that can be done by the agencies at a reasonable cost which will identify employees who do not have the muscular and aerobic fitness required to safely and effectively perform the tasks required of them fighting fire.

10. Was a medic physician advisor consulted during the development of the "Pack Test"?

ANSWER: Yes, Dr. Sharkey's educational and experience background is enclosed. Fitness, human performance and testing have long medical related histories. Dr. Sharkey, as a professional Human Performance/Exercise Physiologist has incorporated the pertinent background and technology in the development of the "Pack Test". The

"Pack Test" has been formally presented to the Occupational Physiology and medicine section of the American College of Sports Medicine in 1994-95 and 96.

11. How/why was the 45 pounds determined to be the weight for the Pack Test?

ANSWER: Early in the project to evaluate the Step Test and 1 1/2 mile run, fire program managers in the federal agencies were polled to determine the critical tasks required of firefighters. Responses showed a high need for firefighters to be able to carry heavy packs such as hose bags, pumps and 5 gallon water bags. The 5 gallon water bag was chosen because it fit the identified task and it is commonly available.

12. Were Demographics of the fire organization (red carded employees) reviewed in the development of the "Pack Test"?

The Wildland Fire fighter Job Task Analysis included input from all Federal agencies from all geographic areas of the United States. The

field testing done to evaluate the Pack Test included statistically valid numbers representing gender, ethnicity, age, height and weight.

13. Has the test protocol been reviewed by medical doctors? With what results?

ANSWER: All phases of test development have been reported at the Occupational Medicine and Physiology Research section of the American College of Sports- Medicine for peer review and feedback- We have consulted with researchers at the U.S. Army Environmental Medicine Laboratory in Natick, and with physicians and physiologists in Canada, Australia and New Zealand. The "Pack Test" has received favorable comments and has caused some to reevaluate their approaches.

14. Define and explain the energy expenditure formula of the Pack Test.

ANSWER: The pack weight and required pace (4 MPH) were determined in laboratory studies to approximate the average energy cost of fireline duties, 22.5 ml of oxygen per kilogram of body weight. The previous fitness standard (45 ml) was based on that energy cost. Correlation analysis of treadmill oxygen intake (max V02), step test and the 1 1/2 mile run score of 45 ml/kg/minute. That indicates that the "Pack Test" does not "raise the barn. it does show that an individual has the capacity to sustain the energy cost of firefighting duties - at least for 45 minutes.

15. Administering the "Pack Test" to 1200 to 1300 firefighters is a huge investment in time. Additionally there is a concise period of time (window) in which they can be done. Are there recommendations on how this can best be accomplished?

ANSWER: Using the "Pack Test" does require an investment of time and energy but the benefits of screening employees who do not have the aerobic or muscular fitness to safely perform firefighting duties outweigh the drawbacks. our commitment is to perform our work safely and the screening is a small price to pay. Firefighters have been outspoken about the inadequacy of the current fitness testing (Tri-Data Phase I report of the Wildland Firefighter Safety Awareness Study) and the need to have more realistic testing. Anecdotal reports have repeatedly charged that emergency hire firefighters often are not fit enough to walk the fireline to their work assignment or to work effectively through the operational period. Anecdotal reports from medical units have reported that many firefighters they saw were not physically fit enough to perform the work required. A screening that deals with those three areas of concern would be very beneficial to prospective firefighters and the agency.

Fire Program managers will have to work out testing schedules. **compared** to the Step Test the "Pack Test" takes longer **per test it but lends itself** to testing several/many employees at a time. The requirement for physical fitness testing to be done prior to issuing a fire qualification (red card) has not changed so there is no impact on date of completion. A significant benefit to the "Pack Test" is that employees can practice the test and know that they are capable of passing the test prior to coming in for official testing. This should reduce the need for and impact of repeat testing.

16. Is the use of a treadmill acceptable for retesting?

ANSWER: The "Pack Test" was designed and validated on a flat track. No work has been done to validate the tests on a treadmill (it would require at least a 1% grade to adjust for lack of wind resistance, terrain variation etc. Holding the rail for balance would invalidate the test given on the treadmill and it is likely most would need to hold the rail. There is no reason to increase the cost of testing while increasing the risk of inaccurate results.

17. Is it possible to use other packs (not the bladder bag)?

ANSWER: Yes, the test requires that the pack meet the weight specified for the respective test. Good testing will require that pack weights are verified prior to and immediately following testing.

18. The test is to be conducted in temperatures below 80 degrees. In some geographic locations the temperature exceeds 80 degrees during June when employees would need to be tested. What options are available?

ANSWER: The latest publication draft by Dr. Sharkey does not contain the temperature reference. It does include a heat stress and a recommendation about testing during high heat stress conditions.

19. Are there recommendations on how to manage the logistics of administering the "Pack Test"?

ANSWER: Dr. Sharkey makes recommendations on how to conduct the tests in the interest of test validity and safety. We expect to get additional suggestions after the tests have been used for training and practice.

20. There were several questions pertaining to the liability clause and the PAR-Q form. Dr. Sharkey has suggested the use of the forms to encourage and aid employees to assess their personal health and fitness states prior to taking the test. The Forest Service will determine if and how forms such as those 2 are to be used and will include the instructions in the implementation instructions.

21. What is the **reason for omitting blood pressure reading immediately prior to taking the "Pack Test"**?

ANSWER: Use of blood pressure (or similar types of information like heart rate used in the Step Test) violates the EEOC's interpretation of the Americans with Disabilities Act (ADA). Blood pressure was not a parameter in the test or previous testing and has no direct correlation with the ability of employees to safely and effectively perform the tasks of their positions.

22. Were fire medical records reviewed; was a fire medic advisor consulted?

ANSWER: In 1994-95, interviews were conducted with crew members, safety officers and crew "bosses". KMC and the SHWT continually review medical records, injury reports and other information related to employee injuries and illnesses. We requested advice from physicians, physiologists, field workers and others during the development and field evaluation of the test. The NWCG SHWT was also consulted and asked for comments during the development process.

23. Were demographics of the fire organization reviewed?

ANSWER: Yes, all studies included female subjects and in the field study, we attempted to "mirror" the composition of the work force in terms Of gender, ethnicity, age, height and weight of firefighters. This consideration is mandated by the Federal Uniform Guidelines for Employee Selection procedures.

24. Has the "Pack Test" protocol been reviewed by medical doctors?

ANSWER: Yes, see response above: American College of Sports Medicine, U.S. Army, etc. None has questioned the test. U.S. Army has conducted studies in which they trained female recruits to hike at 4.4 mph with 75 pounds.

25. Liability; what does the EEOC have to do with it?

ANSWER: The language for the suggested waiver comes from an EEOC publication that discusses the ADA. The ADA precludes asking questions re: a candidate's health or disability in a pre-employment test. The EEOC suggests this waiver subject to managements, approval.

26. Why use the PAR Q form?

ANSWER: It is a validated questionnaire that has been shown to substantially reduce risk in exercise tests and training. Developers require that it be used as is. We do not intend to see the responses on the PAR Q, only to confirm that the candidate read and understood what it says. The form considers the major risks - other questions were discarded during the development of the form.

27. Can the Pack Test be used to meet the fitness requirements for Law Enforcement?

ANSWER: Yes, the Law Enforcement Coordinators for western regions of the FWS agreed to also use the Pack Test as a means to test fitness for LE personnel. Those passing the Pack Test will receive a Level 5 Fitness Rating.

28. Let's say that I start out with a 45 pound pack to do the pack test. I pass the 2 mile mark in under 30 minutes, but it takes me over 45 minutes to finish the 3 mile course. Can I receive a Moderate rating?

ANSWER: Yes. This would more than demonstrate your ability to perform at a Moderate level.

APPENDIX F: TEWAUKON COMPLEX FIRE STEP-UP PLAN

Staffing Class I and II - Burning Index - Low to Moderate

Primary engines staged at field station.

All firefighters carry PPE while on duty.

Fire staff maintain radio contact.

All fire equipment used for project work will be brought in at the end of each day and maintained in a fire ready condition.

Firefighters maintain response time with engine of 60 minutes.

Staffing Class III - Burning Index - High

All Staffing Class II actions plus:

Firefighters maintain response time with engine of 30 minutes.

Staffing Class IV - Burning Index - Very High

All Staffing Class III actions plus:

Zone FMO is notified and starts the process to open emergency pre-suppression account.

Fire staff are with assigned engines and ready to respond to a fire call in 5 minutes or less.

Staffing Class V - Burning Index - Extreme

All Staffing Class IV actions plus:

Non-fire personnel may be placed on standby.

Temporary closures may be imposed on areas in the refuge or for certain activities at the Project Leaders discretion.

Increased patrols of the Refuge.

Step up plan may not apply when refuge resources are assigned to fires.

Once an emergency pre-suppression account is established/available the FMO or Refuge Managers may authorize overtime for Very High or Extreme step up actions that can not be met with regularly scheduled employees. Collateral duty firefighters may be assigned emergency pre-suppression duties if needed.

Severity funding may be essential to provide adequate fire protection for the Complex during drought years. Severity funds may be used to hire additional firefighters, extend firefighter seasons, or to provide additional resources. The FWS Fire Management Handbook provides guidelines for using severity funding.

APPENDIX G: DISPATCH PLAN

WILDLAND FIRE SITUATION ANALYSIS

Incident Name:

Jurisdiction:

Date and Time Completed:

This page is completed by the Agency Administrator(s).

Section I, WFSA Information Page

- A. Jurisdiction(s):** Assign the agency or agencies that have or could have fire protection responsibility, e.g., USFWS, BLM, etc.
- B. Geographic Area:** Assign the recognized "Geographic Coordination Area" the fire is located in, e.g., Northwest, Northern Rockies, etc.
- C. Unit(s):** Designate the local administrative unit(s), e.g., Hart Mountain Refuge Area, Flathead Indian Reservation, etc.
- D. WFSA #:** Identify the number assigned to the most recent WFSA for this fire.
- E. Fire Name:** Self-explanatory.
- F. Incident #:** Identify the incident number assigned to the fire.
- G. Accounting Code:** Insert the local unit's accounting code.
- H. Date/Time Prepared:** Self-explanatory.
- I. Attachments:** Check here to designate items used to complete the WFSA. "Other could include data or models used in the development of the WFSA. Briefly describe the "other" items used.

I. Wildland Fire Situation Analysis		
To be completed by the Agency Administrator(s)		
A. Jurisdiction(s)	B. Geographic Area	
C. Unit(s)	D. WFSA #	
E. Fire Name	F. Incident #	
G. Accounting Code:		
H. Date/Time Prepared _____ @ _____		
I. Attachments		
- Complexity Matrix/Analysis *	_____	
- Risk Assessment/Analysis *	_____	
Probability of Success *	_____	
Consequences of Failure *	_____	
- Maps *	_____	

- Decision Tree **	_____	
- Fire Behavior Projections *	_____	
- Calculations of Resource Requirements *	_____	
- Other (specify)	_____	
* Required ** Required by FWS		

This page is completed by the Agency Administrator(s).

Section II. Objectives and Constraints

- A. Objectives:** Specify objectives that must be considered in the development of alternatives. Safety objectives for firefighter, aviation, and public must receive the highest priority. Suppression objectives must relate to resource management objectives in the unit resource management plan.

Economic objectives could include closure of all or portions of an area, thus impacting the public, or impacts to transportation, communication, and resource values.

Environmental objectives could include management objectives for airshed, water quality, wildlife, etc.

Social objectives could include any local attitudes toward fire or smoke that might affect decisions on the fire.

Other objectives might include legal or administrative constraints which would have to be considered in the analysis of the fire situation, such as the need to keep the fire off other agency lands, etc.

- B. Constraints: List constraints on wildland fire action. These could include constraints to designated wilderness, wilderness study areas, environmentally or culturally sensitive areas, irreparable damage to resources or smoke management/air quality concerns. Economic constraints, such as public and agency cost, could be considered here.**

II.	Objectives and Constraints
To be Completed by the Agency Administrator(s)	
A. Objectives (Must be specific and measurable) <div> <div>1. <i>Safety</i></div> <div> - Public - Firefighter </div> </div> <div>2. <i>Economic</i></div> <div>3. <i>Environmental</i></div> <div>4. <i>Social</i></div> <div>5. <i>Other</i></div> B. Constraints	

This page is completed by the Fire Manager and/or Incident Commander.

Section III. Alternatives

- A. Wildland Fire Management Strategy:** Briefly describe the general wildland fire strategies for each alternative. Alternatives must meet resource management plan objectives.
- B. Narrative:** Briefly describe each alternative with geographic names, locations, etc., that would be used when implementing a wildland fire strategy. For example: "Contain within the Starvation Meadows' watershed by the first burning period."
- C. Resources Needed:** Resources described must be reasonable to accomplish the tasks described in Section III.B. It is critical to also look at the reality of the availability of these needed resources.
- D. Final Fire Size:** Estimated final fire size for each alternative at time of containment.
- E. Estimated Contain/Control Date:** Estimates of each alternative shall be made based on predicted weather, fire behavior, resource availability, and the effects of suppression efforts.
- F. Cost:** Estimate all incident costs for each alternative. Consider mop-up, rehabilitation, and other costs as necessary.
- G. Risk Assessment - Probability of Success/Consequences of Failure:** Describe probability as a percentage and list associated consequences for success and failure. Develop this information from models, practical experience, or other acceptable means. Consequences described will include fire size, days to contain, days to control, costs, and other information such as park closures and effect on critical habitat. Include fire behavior and long-term fire weather forecasts to derive this information.
- H. Complexity:** Assign the complexity rating calculated in "Fire Complexity Analysis" for each alternative, e.g., Type II, Type I.
- I. A map for each alternative should be prepared.** The map will be based on the "Probability of Success/Consequences of Failure" and include other relative information.

III.	Alternatives (To be completed by FMO / IC)
-------------	---

	A	B	C
A. Wildland Fire Strategy			
B. Narrative			
C. Resources needed Handcrews Engines Dozers Airtankers Helicopters	 	 	
D. Final Size			
E. Est. Contain/ Control Date			

F. Costs			
G. Risk Assessment - Probability of success - Consequence of failure	 	 	
H. Complexity			
I. Attach maps for each alternative			

This page is completed by the Agency Administrator(s), FMO and/or Incident Commander.

Section IV. Evaluation of Alternatives

- A. Evaluation Process:** Conduct an analysis for each element of each objective and each alternative. Objectives shall match those identified in Section II.A. Use the best estimates available and quantify whenever possible. Provide ratings for each alternative and corresponding objective element. Fire effects may be negative, cause no change, or may be positive. Examples are: 1) a system which employs a "-" for negative effect, a "0" for no change, and a "+" for positive effect; 2) a system which uses a numeric factor for importance of the consideration (soils, watershed, political, etc.) and assigns values (such as -1 to +1, - 100 to +100, etc.) to each consideration, then arrives at a weighted average. If you have the ability to estimate dollar amounts for natural resource and cultural values, this data is preferred. Use those methods which are most useful to managers and most appropriate for the situation and agency. To be able to evaluate positive fire effects, the area must be included in the resource management plan and consistent with prescriptions and objectives of the fire management plan.

Sum of Economic Values: Calculate for each element the net effect of the rating system used for each alternative. This could include the balance of:

pluses (+) and minuses (-), numerical rating (-3 and +3), or natural and cultural resource values in dollar amounts. (Again, resource benefits may be used as part of the analysis process when the wildland fire is within a prescription consistent with approved Fire Management Plans and in support of the unit's Resource Management Plan.)

IV. Evaluation of Alternatives			
To be Completed by the Agency Administrator(s) and Fire Manager / Incident Commander			
A. Evaluation Process	A	B	C
Safety Firefighter Aviation Public			
<i>Sum of Safety Values</i>			
Economic Forage Improvements Recreation Timber Water Wilderness Wildlife Other (specify)			
<i>Sum of Economic Values</i>			

Environmental Air Visual Fuels T & E Species Other (specify)			
Sum of Environmental Values			
Social Employment Public Concern Cultural Other (Specify)			
Sum of Social Values			
Other			

This page is completed by the Agency Administrator(s) and Fire Manager and/or Incident Commander.

Section V. Analysis Summary

- A. Compliance with Objectives:** Prepare narratives that summarize each alternative's effectiveness in meeting each objective. Alternatives that do not comply with objectives are not acceptable. Narrative could be based on effectiveness and efficiency. For example: "most effective and least efficient," "least effective and most efficient," or "effective and efficient." Or answers could be based on a two-tiered rating system such as "complies with objective" and "fully complies with or exceeds objective." Use a system that best fits the manager's needs.

- B. Pertinent Data:** Data for this Section has already been presented, and is duplicated here to help the Agency Administrator(s) confirm their selection of an alternative. Final Fire Size is displayed in Section III.D. Complexity is calculated in the attachments and displayed in Section III.H. Costs are displayed on page 4. Probability of Success/Consequences of Failure is calculated in the attachments and displayed in Section III.G.
- C. External and Internal Influences:** Assign information and data occurring at the time the WFSA is signed. Identify the Preparedness Index (1 through 5) for the National and Geographic levels. If available, indicate the Incident Priority assigned by the MAC Group. Designate the Resource Availability status. This information is available at the Geographic Coordination Center, and is needed to select a viable alternative. Designate "yes," indicating an up-to-date weather forecast has been provided to, and used by, the Agency Administrator(s) to evaluate each alternative. Assign information to the "Other" category as needed by the Agency Administrator(s).

Section IV. Decision

Identify the alternative selected. Must have clear and concise rationale for the decision, and a signature with date and time. Agency Administrator(s) is mandatory.

V. Analysis Summary			
To be Completed by the Agency Administrator(s) and Fire Manager / Incident Commander			
Alternatives	A	B	C
A. Compliance with Objectives Safety Economic Environmental Social Other			

B. Pertinent Data Final Fire Size Complexity Suppression Cost Resource Values Probability of Success Consequences of Failure			
C. External / Internal Influences National & Geographic Preparedness Level <hr/> Incident Priority <hr/> Resource Availability <hr/> Weather Forecast (long-range) <hr/> Fire Behavior Projections <hr/>			
VI. Decision			
The Selected Alternative is: _____ Rationale: <div style="display: flex; justify-content: space-between;"> <div>_____ Agency Administrator's Signature</div> <div>_____ Date/Time</div> </div>			

This Section is completed by the Agency Administrator(s) or designate.

Section VII. Daily Review

The date, time, and signature of reviewing officials are reported in each column for each day of the incident. The status of Preparedness Level, Incident Priority, Resource Availability, Weather Forecast, and WFSA validity is completed for each day reviewed. Ratings for the Preparedness Level, Incident Priority, Resource Availability, Fire Behavior, and Weather Forecast are addressed in Section V.C. Assign a "yes" under "WFSA Valid" to continue use of this WFSA. A "no" indicates

this WFSA is no longer valid and another WFSA must be prepared or the original revised.

Section VIII. Final Review

This Section is completed by the Agency Administrator(s). A signature, date, and time are provided once all conditions of the WFSA are met.

VIII. Daily Review											
To be completed by the Agency Administrator(s) or Designate											
Selected to be reviewed daily to determine if still valid until containment or control											
			P R E P A R E D N E S S L E V E L	I N C I D E N T P R I O R I T Y	R E S O U R C E A V A I L A B I L I T Y	W E A T H E R F O R E C A S T	F I R E B E H A V I O R P R O J E C T I O N S	W F S A V A L I D			
			Date	Time	By						

If WFSA is no longer valid, a new WFSA will be completed!								
VIII. Objectives Final Review								
The elements of the selected alternative were met on: _____ _____ <div style="text-align: right;">Date</div> <div style="text-align: right;">Time</div> By: _____ <div style="text-align: center;">(Agency Administrator(s))</div>								

A GUIDE FOR ASSESSING FIRE COMPLEXITY

The following questions are presented as a guide to assist the Agency Administrator(s) and staff in analyzing the complexity or predicted complexity of a wildland fire situation. Because of the time required to assemble or move an Incident Management Team to wildland fire, this checklist should be completed when a wildland fire escapes initial attack and be kept as a part of the fire records. This document is prepared concurrently with the preparation of (and attached to) a new or revised Wildland Fire Situation Analysis. It must be emphasized this analysis should, where possible, be based on predictions to allow adequate time for assembling and transporting the ordered resources.

Use of the Guide:

1. Analyze each element and check the response "yes" or "no."
2. If positive responses exceed, or are equal to, negative responses within any primary factor (A through G), the primary factor should be considered as a positive response.
3. If any three of the primary factors (A through G) are positive responses, this indicates the fire situation is, or is predicted to be, Type I.
4. Factor H should be considered after all the above steps. If more than two of these items are answered "yes," and three or more of the other primary factors are positive responses, a Type I team should be considered. If the composites of H are negative, and there are fewer than three positive responses in the primary factors (A-G), a Type II team should be considered. If the answers to all questions in H are negative, it may be advisable to allow the existing overhead to continue action on the fire.

GLOSSARY OF TERMS

Potential for blow-up conditions - Any combination of fuels, weather, and topography excessively endangering personnel.

Rate or endangered species - Threat to habitat of such species or, in the case of flora, threat to the species itself.

Smoke management - Any situation which creates a significant public response, such as smoke in a metropolitan area or visual pollution in high-use scenic areas.

Extended exposure to unusually hazardous line conditions - Extended burnout or backfire situations, rock slide, cliffs, extremely steep terrain, abnormal fuel situation such as frost killed foliage, etc.

Disputed fire management responsibility - Any wildland fire where responsibility for management is not agreed upon due to lack of agreements or different interpretations, etc.

Disputed fire policy - Differing fire policies between suppression agencies when the fire involves multiple ownership is an example.

Pre-existing controversies - These may or may not be fire management related. Any controversy drawing public attention to an area may present unusual problems to the fire overhead and local management.

Have overhead overextended themselves mentally or physically - This is a critical item that requires judgment by the responsible agency. It is difficult to write guidelines for this judgment because of the wide differences between individuals. If, however, the Agency Administrator feels the existing overhead cannot continue to function efficiently and take safe and aggressive action due to mental or physical reasons, assistance is mandatory.

FIRE COMPLEXITY ANALYSIS

A.	FIRE BEHAVIOR: Observed or Predicted	Yes/No
1.	Burning Index (from on-site measurement of weather conditions).	_____
	Predicted to be above the 90% level using the major fuel model in which the fire is burning.	
2.	Potential exists for "blowup" conditions (fuel moisture, winds, etc.)	_____
3.	Crowning, profuse or long-range spotting.	_____

4. Weather forecast indicating no significant relief or worsening conditions.		_____	_____
Total		_____	_____
B. RESOURCES COMMITTED			
1. 200 or more personnel assigned.		_____	_____
2. Three or more divisions.		_____	_____
3. Wide variety of special support personnel.		_____	_____
4. Substantial air operation which is not properly staffed.		_____	_____
5. Majority of initial attack resources committed.		_____	_____
Total		_____	_____
C. RESOURCES THREATENED			
1. Urban interface.		_____	_____
2. Developments and facilities.		_____	_____
3. Restricted, threatened or endangered species habitat.		_____	_____
4. Cultural sites.		_____	_____
5. Unique natural resources, special designation zones or wilderness.		_____	_____
6. Other special resources.		_____	_____
Total		_____	_____
D. SAFETY			
1. Unusually hazardous fire line conditions.		_____	_____
2. Serious accidents or facilities.		_____	_____
3. Threat to safety of visitors from fire and related operations.		_____	_____
4. Restricted and/or closures in effect or being considered.		_____	_____
5. No night operations in place for safety reasons.		_____	_____
Total		_____	_____
E. OWNERSHIP		Yes/No	
1. Fire burning or threatening more than one jurisdiction.		_____	_____
2. Potential for claims (damages).		_____	_____
3. Conflicting management objectives.		_____	_____

4.	Disputes over fire management responsibility.	_____	_____
5.	Potential for unified command.	_____	_____
Total		_____	_____
F. EXTERNAL INFLUENCES			
1.	Controversial wildland fire management policy.	_____	_____
2.	Pre-existing controversies/relationships.	_____	_____
3.	Sensitive media relationships.	_____	_____
4.	Smoke management problems.	_____	_____
5.	Sensitive political interests.	_____	_____
6.	Other external influences.	_____	_____
Total		_____	_____
G. CHANGE IN STRATEGY			
1.	Change in strategy to control from confine or contain.	_____	_____
2.	Large amount of unburned fuel within planned perimeter.	_____	_____
3.	WFSA invalid or requires updating.	_____	_____
Total		_____	_____
H. EXISTING OVERHEAD			
1.	Worked two operational periods without achieving initial objectives.	_____	_____
2.	Existing management organization ineffective.	_____	_____
3.	IMT overextended themselves mentally and/or physically.	_____	_____
4.	Incident action plans, briefings, etc., missing or poorly prepared.	_____	_____
Total		_____	_____

Signature_____

Date_____ **Time**_____

DELEGATION OF AUTHORITY

Tewaukon National Wildlife Refuge Complex
Cayuga, North Dakota

As of ____ (Time) and (date), I have delegated authority to manage the ____ (Fire/Incident Name and Fire Number), Tewaukon National Wildlife Refuge Complex, to Incident Commander ____ (Name) and his incident management team.

As Incident Commander, you are accountable to me for the overall management of this incident including its control and return to local forces. I expect you to adhere to relevant and applicable laws, policies, and professional standards. While the suppression of the fire is your primary task, you are expected to do so in a manner that provided for the safety and well being of involved personnel. Consideration for the needs of local residents and communities is essential for successful management of the incident.

I am assigning ____ (Name) As the line officer representative to act as liaison and provide any help you need. (S)He is authorized to speak for me in the event a decision is needed.

My specific considerations for management of this fire are:

1. Ensure the safety of firefighters, visitors, and public.
2. Protect private and refuge property to the extent possible
3. Minimize damage to environmental resources
4. Key resource considerations are: protecting rare, threatened, and endangered species: preserving as much wildlife habitat as possible; avoiding wildlife entrapment situations; protecting cultural resources; and limiting degradation of the Complex's aesthetic values.
5. Restrictions for suppression actions are no earthmoving equipment (dozers, discs, plows, graders) without approval of the Project Leader.
6. Manage the fire cost-effectively for the values at risk.
7. Provide training opportunities for Service personnel when ever possible in order to strengthen our organizational capabilities.

Signed: _____ Date:
Project Leader

APPENDIX I - COMPLEXITY ANALYSIS

Prescribed Fire Complexity Worksheet

Using the attached criteria, rate each element on a scale of 0 to 9, then multiply by the weighting factor (shown in parentheses in first column) to determine the weighted subvalues. Add the subvalues to determine the total weighted value which is used to determine the complexity of the prescribed burn.

PREScribed FIRES:

COMPLEXITY ELEMENT/ (WEIGHTING FACTOR)	RATING VALUE	WEIGHT SUBVALUE	LOW BURN COMPLEXITY	HIGH BURN COMPLEXITY
1. Potential for escape (10)			Very low probability.	High probability.
2. Values at risk (10)			Very little risk to people, property, resources.	Great risk to people, property, resources.
3. Fuels/fire behavior (6)			Mostly uniform and predictable.	Great variability & unpredictability. Prescription includes very low fuel moisture conditions.
4. Fire duration (7)			Fire generally of short duration & require little management.	Fires of long duration & require continuous management.
5. Smoke/air quality (7)			Smoke impacts are low or insignificant.	Smoke sensitive areas frequently affected.
6. Ignition methods (3)			Simple & rarely hazardous.	Highly technical or frequently hazardous.
7. Management team size (3)			Burn requires a few generalized positions.	Burn requires large team of separate, specialized positions.
8. Treatment objectives (5)			Objectives simple & easy to achieve. Prescriptions are broad & encompass safe burning conditions.	Objectives are difficult to achieve. Prescriptions are restrictive or burning conditions are risky.
Total Weighted Value:				

Low Complexity: 50 - 115 Total Weighted Value Points - Management Level: RXB3
 Normal Structure: 116 - 280 Total Weighted Value Points - Management Level: RXB2
 Complex Structure: 281 - 450 Total Weighted Value Points - Management Level: RXB1

Prepared by (RXBB/FMO)

Date

PREScribed FIRE COMPLEXITY ELEMENT RATING CRITERIA

Complexity elements are used to define the relative complexity of a prescribed fire project. For the 8 complexity elements listed, users assign a complexity score of 0, 1, 3, 5, 7 or 9, based upon the rating criteria described for each numeric score. Even numbers or numbers greater than 9 are not permitted. If a specific prescribed burn does not precisely match the stated criteria in every respect, a station will have to use its best judgment determine which rating is most appropriate. Each prescribed burn does not have to meet all listed rating criteria for a particular numeric score to qualify for that rating. Each higher rating category includes all the rating criteria listed for the previous categories.

These rating criteria will be used for all management ignited prescribed fires (prescribed burns), regardless of size. The complexity score will be included on the Fire Report (DI-1202) in the "Remarks" section. Post-fire complexity ratings are used to compile a summary complexity score for the normal prescribed fire year, which is used in the FireBase budget analysis for funding and staffing needs.

COMPLEXITY ELEMENTS

1. POTENTIAL FOR ESCAPE:

<u>Score</u>	<u>Criteria</u>
--------------	-----------------

[0]	No potential for prescribed fire escape. Burn unit surrounded by non-burnable fuel or water.
[1]	Little potential of spot fires outside burn unit. If occurring, only one to two totaling no more than 0.25 acre. Spots can be controlled utilizing on-site holding forces.
[3]	Potential for multiple spot fires (more than two) outside the burn unit totaling less than 1 acre, but still controllable utilizing on-site holding resources. One or two dangerous fuel concentrations exist near the burn unit perimeter, and are expected to result in limited torching and spotting potential.
[5]	Potential for multiple spot fires outside the burn unit totaling more than 1 acre, requiring greater than average holding capability along certain sections of burn perimeter. Additional holding resources may be needed to control if escape occurs. Fuel outside burn unit is continuous, with limited fuel breaks. Engines and heavy equipment are primary suppression tools.
[7]	An escaped fire will exceed the capability of the holding resources on site. Additional resources will need to be requested for suppression. Escaped fire will cause implementation of contingency plan, and prescribed burn will be declared a wildfire. Fuel outside burn unit may be continuous and heavy with no fuel breaks making suppression efforts difficult. Engines and heavy equipment are primary suppression tools. Probability of Ignition greater than 70 percent.
[9]	Good potential for multiple fire escapes. An escaped fire will exceed the capability of the holding resources on site and additional resources will need to be requested. Escaped fires will cause implementation of contingency plan and prescribed burn will be declared a wildfire. Fuel outside the burn unit is extensive and heavy, making suppression actions difficult. Prescription calls for fireline intensity and fuel moisture in the primary fuel model that are known to cause serious spotting potential. Probability of Ignition greater than 85 percent. Wind speeds at the upper end of prescription.

2. VALUES AT RISK

<u>Score</u>	<u>Criteria</u>
--------------	-----------------

- | | |
|-----|---|
| [0] | No risk to people, property, cultural and natural resources, either inside the designated burn unit or in the event of fire escape. |
| [1] | Burn is in an area infrequently visited by people and contains no historic structures, buildings, sensitive biological communities, T&E species, or habitats that could be damaged by prescribed fire. The area adjacent to the burn may contain a few locally significant natural or cultural resources, or structures that could be damaged by fire escapes. |
| [3] | Burn is in an area occasionally visited by people, and may be adjacent to a primary field unit road. The burn unit contains structures, cultural resources, sensitive biological communities, or T&E habitat that must be protected from fire. |
| [5] | Burn is in an area that receives moderate use. Public safety is a major concern addressed in the burn unit plan, but still requires a minor commitment of project resources. The unit may contain several significant structures; there may be one or two primary natural or cultural resources (as identified in the station fire management plan) inside or immediately adjacent to the burn unit which must be protected from fire. - OR - the area adjacent to the burn unit contains one or two cultural or natural resources, or structures valued between \$50,000 and \$250,000 that could be threatened by fire escapes. |
| [7] | Burn is in an area that receives moderate use, and protecting public safety requires a modest commitment of project resources. The burn unit may contain several significant structures, and contain or be immediately adjacent to several sensitive biological communities or habitats (as identified in station fire management plan) that must be protected from fire. - OR - the area adjacent to the burn unit contains three or more cultural or natural resources or developed sites with structures valued between \$250,000 and \$500,000 that could be threatened by fire escapes. |
| [9] | The burn unit is in an area of concentrated public use, and protecting public safety requires a major commitment of project resources. The unit may contain several major structures (such as residences, historic buildings) and there may be critical natural or cultural resources (such as threatened or endangered species, or major archeological artifacts) inside the burn unit that must be protected from fire. - OR - the area adjacent to the burn unit contains critical natural or cultural resources or developed sites with structures valued at more than \$500,000. |

3. FUELS/FIRE BEHAVIOR

<u>Score</u>	<u>Criteria</u>
--------------	-----------------

- | | |
|-----|--|
| [1] | Fuels are uniform, and fire behavior is easily predicted using the standard fire behavior models and prediction systems (BEHAVE PROGRAM). Terrain is mostly flat, or the slope is uniform. |
| [3] | Fuels within the primary model vary somewhat in loadings and arrangement, but are still well represented by one of the standard fire behavior fuel models. There may be small areas of secondary fuel types present, mostly away from the burn unit perimeter. The terrain contains low relief, and slope and aspect cause minor variations in fire behavior. The fire behavior variations present no difficulties in carrying out the burn, and the predominant fire behavior still can be predicted easily under most prescription conditions. |
| [5] | Considerable variation exists within the primary fuel complex. Prescriptions may be based on two fuel models, or may require a customized model in addition to or in place of a standard model. A few areas of unusual fuel concentrations or atypical fuels not well represented by the prescription-based models may exist on or near the burn unit perimeter. The terrain contains significant relief, |

but the variations present only minor control problems, and no problems in meeting burn unit objectives. Fire behavior can still be predicted using standard fire behavior prediction systems.

- [7] Major variations in the fuel complex require **two or more** fuel models, and may require several customized models. High fuel concentrations and atypical fuels not well represented by the prescription-based models may be common on or near the burn unit perimeter. The terrain encompasses two or three major vegetative communities through a broad elevational gradient. Variations in slope and aspect have major effects on fuels, fire weather and fuel moisture. The resulting variations in fire behavior may present moderate fire control problems and minor problems in meeting the overall burn unit objectives. Fire behavior cannot be predicted well using standard fire behavior prediction systems without application of adjustment factors.
- [9] The burn unit contains highly variable fuels throughout, making it difficult to utilize standard or customized fuel models. The terrain encompasses more than three major vegetative communities through an elevation gradient so broad that more than one climate zone may be present. Wide variations in slope, aspect and elevation have major effects on fuels, fire weather and fuel moisture. The resulting variations in fire behavior may present major fire control problems and moderate problems in meeting overall burn unit objectives. Fire behavior cannot be predicted well without the aid of local experts (Fire Behavior Analysis).

4. FIRE DURATION

Score Criteria

- [1] Entire burn unit will be burned in one burning period. Some minor residual burning may continue inside the unit, but requires no continued resource commitment. Primarily 1-hour fuels.
- [3] Complete burnout of burn unit requires 1 to 3 days. Some minor residual burning may continue inside the unit, but requires no continued resource commitment. Primarily 10-hour fuels.
- [5] Complete burnout of burn unit requires 2 to 3 days. Significant residual burning inside the burn perimeter may continue for up to 3 days, requiring small holding crew. Primarily 100-hour fuels.
- [7] Complete burnout of burn unit requires 3 days to 1 week. Significant residual burning inside the burn perimeter may continue up to another week, requiring a holding crew on site during the burning period. Primarily 1,000-hour fuels.
- [9] Complete burnout of burn unit requires more than 1 week. Significant residual burning may continue for up to another 3 weeks along most of the burn unit perimeter, requiring a complete holding crew on site.

5. AIR QUALITY

Score Criteria

- [1] Burn is remote from developments or visitor use areas or is of such small size that smoke impacts are insignificant. No critical targets are present. Critical targets are areas that are unusually sensitive to smoke impacts. These include areas such as airports, highways, air quality non-attainment areas, and hospitals in which health and safety are quickly and severely impacted by even minimal amounts of smoke, targets that already have an air pollution or visibility problem, and any targets where the impact of smoke will be compounded by the presence of emissions from other sources. Burning is outside the non-attainment areas, and RACM/BACM eliminates any impacts to these areas.
- [3] One or more minor developments or visitor use areas may experience noticeably impaired visibility and increased particulate concentrations, but not in excess of secondary Federal standards. The

impairment is expected to last no more than 3 days. No critical targets are present. There are no impacts to non-attainment areas.

- [5] Several communities or visitor use areas may experience significantly impaired visibility (as defined in State, county, or field station visibility standard) or particulate concentrations exceeding secondary Federal standards. The impairment is expected to last no more than 1 week. Not more than one health-related complaint is likely to be received from health or medical authorities. No critical targets are present. Smoke trajectory is important, but broad.
- [7] One town (more than 20,000 people) or one major visitor use area may experience significantly impaired visibility (as defined in a State, county or field station visibility standard) or particulate concentrations exceeding secondary Federal standards. The impairment is expected to last not more than 1 week. One to three critical targets are present. Smoke trajectory is critical. Mixing height and transport wind speed may be important.
- [9] Several towns (each of 20,000 people or more) or several major visitor areas may experience significantly impaired visibility (as defined in State, county or field station visibility standard) or particulate concentrations exceeding secondary Federal standards. The impairment is expected to last more than 1 week. Any impact likely to result in a violation of a primary Federal air quality standard would also qualify. Smoke trajectory, mixing height, and transport wind speed are critical.

6. IGNITION METHODS

Score Criteria

- [1] Burn is ignited using drip torches, fusees, or other simple ground methods. Ignition requires not more than two personnel. Ignition patterns are simple, with no chance for confusion or hazardous situations to develop.
- [3] Burn is ignited using simple ground methods or Terra Torch device (or equivalent). Ignition requires three to four personnel who may work in small teams igniting separate areas simultaneously. Ignition patterns may be complex enough to require detailed planning, but there is only minor chance of confusion. Ignition team is not expected to become involved in hazardous situations.
- [5] Burn is ignited using a combination of ground methods, or both ground and aerial methods. Ignition requires four to six personnel working in teams to ignite separate areas simultaneously. Burn and ignition complexity requires separate position for ignition specialist. Ignition patterns require detailed planning, coordination between teams, and considerable attention to avoid confusion. Ignition teams may be exposed to hazardous situations for short periods.
- [7] Ignition methods are tailored to accomplish different results in different sections of the burn. Burn unit may be composed of several fuel types requiring different ignition techniques and patterns. Ignition team(s) is composed of six to eight personnel, who may ignite separate areas simultaneously. Several ignition specialists may be required for different segments of the burn. Ignition methods require detailed planning and coordination often including an ignition specialist in aerial command post. Ignition teams are frequently exposed to hazardous situations due to fuels, fire line intensity, and complex terrain. Ignition methods or patterns are subject to revision by burn boss to achieve desired results or due to changing conditions.
- [9] Burn requires a combination of complex aerial and ground techniques, often including helitorch, in complex, hazardous terrain and fuels. Ignition team is composed of more than eight personnel. Ignition methods require detailed planning by experts with extensive experience in specialized techniques. Ignition methods are subject to frequent revision by burn and ignition bosses due to changing or uncertain conditions. Detailed coordination is imperative to avoid placing team members in unacceptably dangerous situations.

7. MANAGEMENT TEAM SIZE

Score Criteria

- | | |
|-----|--|
| [1] | Burn team consists of two to three personnel, with the burn boss holding several overhead positions. |
| [3] | Burn team consists of four to six personnel, including separate positions for Burn Boss and Holding Specialist. |
| [5] | Burn team consists of seven to nine personnel, including separate positions for Burn Boss, Ignition Specialist, and Holding Specialist. |
| [7] | Burn team consists of 10-12 personnel, including Burn Boss, Ignition and Holding Specialist, Aircraft Manager (aerial ignitions), and a Fire Weather Observer. |
| [9] | Burn team consists of more than 12 personnel, including Burn Boss Type I, Holding Boss, Ignition Specialist, Aircraft Manager, Weather Observer, and several ignition and holding foremen. |

8. TREATMENT OBJECTIVES

Score Criteria

- | | |
|-----|--|
| [1] | Objectives are limited to fuel reduction or maintenance burning and are easily achieved (e.g., removing cured grasses from grasslands or field maintenance). Prescriptions are broad and encompass safe burning conditions. |
| [3] | Objectives are limited to dead and downed fuel reduction, or simple habitat restoration projects involving minor changes to vegetation. May involve two or three different fuel models. Objectives are easy to achieve using relatively low-intensity surface fires and simple burning patterns. Range of acceptable results for the burn objectives are broad. |
| [5] | Objectives include dead and downed fuel, and live fuel reduction burns or change to structure of vegetative/habitat communities. Also include habitat conversion projects requiring changes in the composition of two or more vegetation types. Objectives and results are broad and could be moderately difficult to achieve, and may often require moderate intensity fires involving living fuels. Burning patterns are moderately complex. Flame lengths or scorch heights are critical to meet burn objectives. |
| [7] | Objectives include living and dead fuels. Include habitat restoration projects requiring changes in the structure and composition of two or more vegetative habitats. Narrow burn parameters (prescription) fire behavior, smoke dispersal, operational constraints, and other burn criteria present a limited opportunity of project success with a single burn. The chance of success is heavily dependent on careful planning and precise timing. |
| [9] | Objectives include living and dead fuels. Fuel reduction, ecological considerations, and political or operational constraints may be conflicting, requiring careful prioritization of objectives and expert planning. The prescription may require a combination of different fire intensities that makes it difficult to achieve objectives. The prescription criteria and window of opportunity are narrow. Burn objectives are specific, and range of results narrow. Project includes a major change in structure and composition of burn area. The prescription requires burning under risky conditions that could lead to fire escape. |

APPENDIX J: RECOMMENDED FIRE MONITORING STANDARDS - REGION 6

The following are the recommended standards to be used when planning, implementing, and evaluating prescribed burns. These should be viewed as minimum values to be monitored and the information contained in this check list incorporated into a monitoring record sheet.

Planning and Preparation

Environmental Conditions Prior to the Burn

____ Photo Points Established

____ Fuel

____ Model(s)

____ Loading (By Size Class)
 ____ % Cover (Type/Model)
 ____ Continuity
 ____ Crown ratio
 ____ Depth of Fuel Bed
 ____ Other

____ Air Temperature (Maximum - Minimum to develop trends)

____ Relative Humidity (Maximum - Minimum to develop trends)

____ Wind Speed and Direction (Eye-level/20 Foot)

____ Fuel Moisture

____ Dead Fuel Moisture (Use of Fuel Sticks and/or Drying Ovens highly recommended)

____ Live Fuel Moisture (Fuel Models 2,4,5,7,10)

____ Soil Moisture (Dry, Moist, Wet)

____ Drought Indicator (Track One or More)

Execution

Environmental Conditions During the Burn

- _____ Date/Time
- _____ Air Temperature (Every 30 minutes)
- _____ Relative Humidity (Every 30 minutes)
- _____ Wind Speed and Direction (Eye Level) (Every 30 minutes)
- _____ Cloud Cover

- _____ Fuel Moisture (Indicate How Determined: Calculated, Actual)
 - _____ Dead Fuel Moisture (Using above values, calculate every 30 minutes utilizing Tables and Worksheets, Nomograms, BEHAVE, etc.)
 - _____ Live Fuel Moisture (Fuel Models 2,4,5,7,10 - Collect immediately prior to the burn and evaluate later)

Fire Behavior

- _____ Flame length (Head, Flank, Backing)
- _____ Rate of Spread (Forward, Flank, Backing)
- _____ Resistance to Control
- _____ Spotting Distance

Smoke/Air Quality

- _____ Mixing/Dispersal (Good, Fair, Poor)
- _____ Trajectory of Column (Surface/Upper Level)
- _____ Duration (Active Burning/Smoldering)
- _____ Problems

Note: It is recommended that photos be taken to document smoke dispersal.

Post Burn

First Order Fire Effects

- _____ Photo Point
- _____ Percent of Area Burned
- _____ Percent of Fuels Consumed (By Fuel Loading Size Class, when possible)
- _____ Percent of Thatch/Duff Consumed
- _____ Scorch Height
- _____ Mortality

Note: The information in the first two categories will be used to determine the amount of particulate matter produced, and may/will be used by State Air Quality Regulators.

APPENDIX K- COMPREHENSIVE CONSERVATION PLAN